



## AP Microeconomics

# FREE-RESPONSE Scoring Guide with Multiple-Choice Section

1995



Advanced Placement Program®  
THE COLLEGE BOARD

## MICROECONOMICS

Two hours are allotted for this examination: 1 hour and 10 minutes for Section I, which consists of multiple-choice questions; and 50 minutes for Section II, which consists of three mandatory essay questions. Section I is printed in this examination booklet. Section II is printed in a separate booklet.

### SECTION I

Time—1 hour and 10 minutes

Number of questions—60

Percent of total grade—66-2/3

**Section I of this examination contains 60 multiple-choice questions. Therefore, please be careful to fill in only the ovals that are preceded by numbers 1 through 60 on your answer sheet.**

#### General Instructions

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE INSTRUCTED TO DO SO.

INDICATE ALL YOUR ANSWERS TO QUESTIONS IN SECTION I ON THE SEPARATE ANSWER SHEET. No credit will be given for anything written in this examination booklet, but you may use the booklet for notes or scratchwork. After you have decided which of the suggested answers is best, COMPLETELY fill in the corresponding oval on the answer sheet. Give only one answer to each question. If you change an answer, be sure that the previous mark is erased completely.

#### Example:

- Chicago is a  
(A) state  
(B) city  
(C) country  
(D) continent  
(E) village

#### Sample Answer



Many candidates wonder whether or not to guess the answers to questions about which they are not certain. In this section of the examination, as a correction for haphazard guessing, one-fourth of the number of questions you answer incorrectly will be subtracted from the number of questions you answer correctly. It is improbable, therefore, that mere guessing will improve your score significantly; it may even lower your score, and it does take time. If, however, you are not sure of the correct answer but have some knowledge of the question and are able to eliminate one or more answer choices as wrong, your chance of getting the right answer is improved, and it may be to your advantage to answer such a question.

Use your time effectively, working as rapidly as you can without losing accuracy. Do not spend too much time on questions that are too difficult. Go on to other questions and come back to the difficult ones later if you have time. It is not expected that everyone will be able to answer all the multiple-choice questions.

## MICROECONOMICS

### SECTION I

Time — 70 minutes

60 Questions

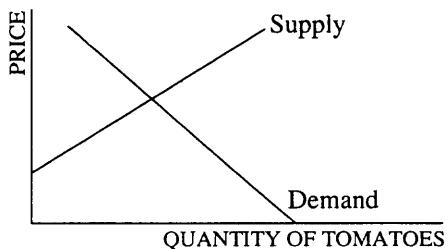
Directions: Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then fill in the corresponding oval on the answer sheet.

1. The allocation of resources in a market economy is described by which of the following statements?
  - I. The government decides which goods will be produced and which consumers will receive them.
  - II. Buyers and sellers exchange goods and services on a voluntary basis.
  - III. Prices and costs help producers decide whether they are producing too little or too much of a good.

(A) I only  
(B) II only  
(C) III only  
(D) I and III only  
(E) II and III only
2. If the government imposes a tax on the production of cars, which of the following will occur in the market for cars?

(A) There will be a movement to the right along the supply curve.  
(B) There will be a movement to the right along the demand curve.  
(C) The supply curve will shift to the right.  
(D) The supply curve will shift to the left.  
(E) The demand curve will shift to the right.
3. Which of the following is true of a price floor?

(A) The intention of the government in creating the price floor is to assist the producers of the good.  
(B) To have an impact in the market for the good, the price floor should be set below the existing market price of the good.  
(C) An effective price floor will increase the quantity demanded of the good.  
(D) The price floor would tend to create a shortage of the good in the market.  
(E) The creation of the price floor would not change the quantity supplied of the good if the supply curve were upward-sloping to the right.



4. On the basis of the graph above, which of the following statements concerning changes in the demand for and supply of tomatoes is correct?
- If both the demand and supply increase, the price of tomatoes will definitely increase.
  - If both the demand and supply decrease, the quantity of tomatoes sold will definitely increase.
  - If the demand decreases while the supply increases, the price of tomatoes will definitely increase.
  - If the demand decreases while the supply increases, the quantity of tomatoes sold will definitely decrease.
  - If the demand increases while the supply decreases, the price of tomatoes will definitely increase.
5. Which of the following best illustrates the concept of consumer surplus?
- A thirsty athlete pays \$0.85 for a cold drink when she would have gladly paid \$1.50 for the drink.
  - An individual who is willing to accept a job at \$7.50 per hour is offered \$7.00 per hour.
  - An individual pays the sale price of \$15.00 for the same shirt that the individual refused to purchase earlier at \$18.00.
  - An individual finds that the price of artichokes, a food she dislikes, has been reduced by 50 percent.
  - A wood-carver has a marginal cost of \$5.00 for a unit of output, but sells that unit at \$6.00.

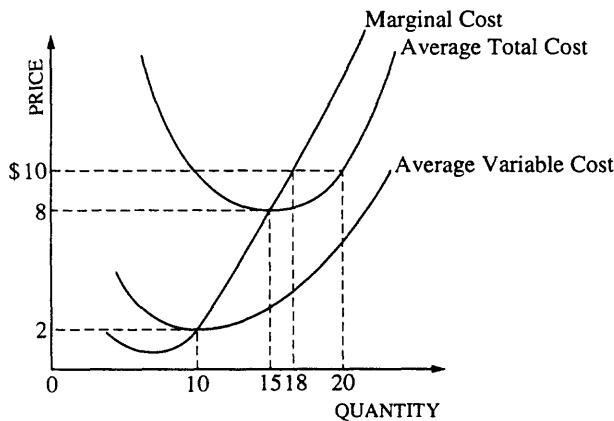
Questions 6-7 are based on the table below, which gives cost information for a perfectly competitive firm.

Quantity	Average Fixed Costs	Average Variable Costs	Marginal Costs
0			
1	\$100.00	\$55.00	\$55.00
2	50.00	45.00	35.00
3	33.33	50.00	60.00
4	25.00	55.00	70.00
5	20.00	60.00	80.00
6	16.67	65.00	90.00

6. The average total cost to the firm of producing 2 units of output is
- \$ 35.00
  - \$ 85.00
  - \$ 95.00
  - \$100.00
  - \$130.00
7. If the product price is \$85, how many units of output must the firm produce in order to maximize profits?
- 0
  - 3
  - 4
  - 5
  - 6

8. Which of the following factors can cause a firm's cost curves to shift upward?

- (A) An increase in wages
- (B) An increase in the firm's output
- (C) An increase in the output price
- (D) A decrease in the firm's output
- (E) A decrease in the price of energy



9. The diagram above shows a perfectly competitive firm's short-run cost curves. If the price of the output increases from \$8 to \$10, the profit-maximizing firm will

- (A) continue producing 15 units because average total cost is at a minimum
- (B) continue producing 15 units because average total cost is equal to marginal cost
- (C) increase output to 20 units because this is the output at which price equals average total cost
- (D) increase output to 18 units because this is the output at which price equals marginal cost
- (E) decrease output to 10 units because this is the output at which average variable cost is at a minimum

10. Which of the following statements is true about a firm that sells its output in a perfectly competitive market?

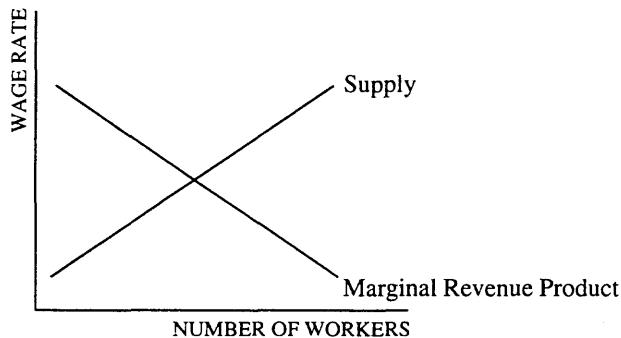
- (A) The demand for its product is a downward-sloping function.
- (B) The firm will earn zero economic profits in long-run equilibrium.
- (C) Advertising is an important tool of the firm.
- (D) The firm will increase its total economic profits if it charges a price that is lower than the market price.
- (E) The marginal revenue the firm receives from selling an additional unit of output will be different from the price at which it sells that unit.

11. One justification for government regulation of a monopoly is that the unregulated monopoly

- (A) earns a normal profit
- (B) pays its workers a lower wage than if the market were competitive
- (C) has a very elastic demand curve
- (D) charges a price higher than a competitive market price
- (E) sells too much of the product

12. Which of the following is most likely to shift the demand for aircraft mechanics to the right?

- (A) An increase in the demand for air travel
- (B) An increase in the price of a license necessary for aircraft mechanics
- (C) A decrease in the price of a license necessary for aircraft mechanics
- (D) A decrease in the demand for air travel
- (E) A decrease in the marginal productivity of aircraft mechanics



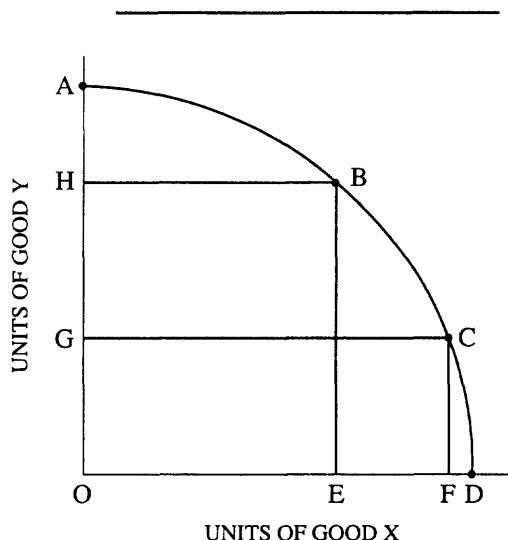
13. The graph above shows the marginal revenue product curve and supply curve of labor for a firm. The introduction of new management techniques dramatically increases worker productivity. Which of the following changes is most likely to occur?
- The supply curve will shift to the left, increasing the wage rate.
  - The supply curve will shift to the right, increasing employment.
  - The marginal revenue product curve will shift to the right, increasing the wage rate.
  - The marginal revenue product curve will shift to the left, reducing employment.
  - Neither the marginal revenue product curve nor the supply curve will shift, but the wage will increase and employment will fall.
14. If the production of a good results in a positive externality, the government might be able to improve economic efficiency in this market by
- eliminating private production of the good
  - imposing a tax on private producers
  - promoting the export of the surplus output
  - initiating antitrust action
  - granting a subsidy to private producers

15. All of the following are sources of inequality in the distribution of personal income EXCEPT

- progressive income taxes
- discrimination in employment
- differences in personal motivation
- differences in educational level attained
- differences in abilities

16. An outward shift in the production possibilities curve of an economy can be caused by an increase in

- unemployment
- the labor force
- inflation
- output
- demand

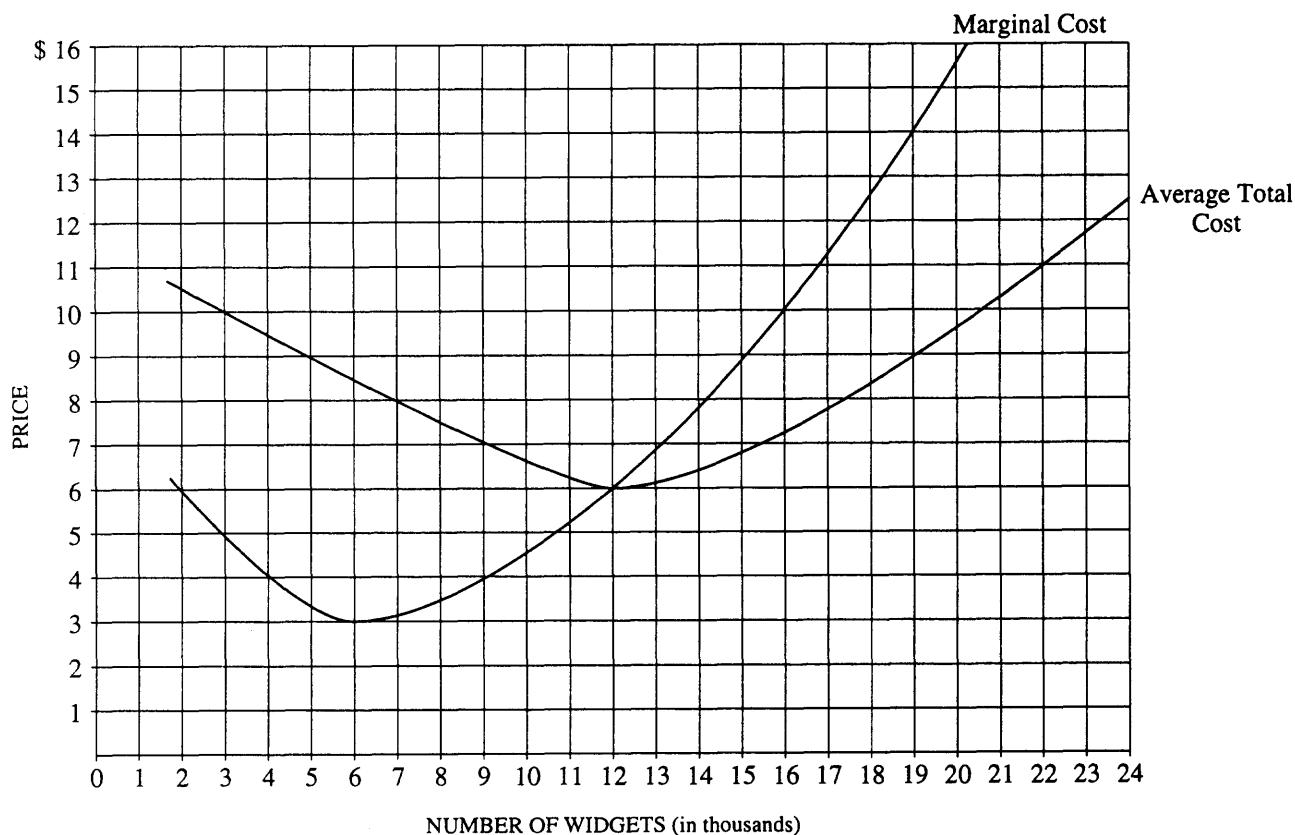


17. The graph above shows an economy's production possibilities frontier for the production of two goods, X and Y. Assume that the economy is currently at point B. The opportunity cost of moving from point B to point C is

- AH units of good Y
- HG units of good Y
- OG units of good Y
- EF units of good X
- OF units of good X

18. If the demand for potatoes increases whenever a person's income increases, then potatoes are an example of
- (A) an inferior good
  - (B) a free good
  - (C) a Giffen good
  - (D) a normal good
  - (E) a public good
19. The American Heart Association has just issued a report warning consumers about the negative health effects of eating beef. Which of the following changes in the beef market is most likely to occur as a result?
- (A) The supply curve will shift to the left, increasing the price of beef.
  - (B) The demand curve will shift to the left, decreasing the price of beef.
  - (C) The demand curve will shift to the right, increasing the price of beef.
  - (D) Neither the supply nor demand curve will shift; only quantity will increase as price decreases.
  - (E) Neither the supply nor demand curve will shift; only quantity will decrease as price increases.
20. Which of the following is most likely to increase the supply of soldiers for an all-volunteer army?
- (A) A decrease in the salaries paid to soldiers
  - (B) A decrease in the average wage rate in civilian employment
  - (C) A reduction in college tuition benefits provided to soldiers
  - (D) The imposition of new restrictions on women in the military
  - (E) An increase in the required length of service
21. If the increase in the price of one good decreases the demand for another, then the two goods are
- (A) inferior goods
  - (B) luxury goods
  - (C) normal goods
  - (D) substitute goods
  - (E) complementary goods
22. Which of the following is true about a firm's average variable cost?
- (A) It will rise if marginal cost is less than average variable cost.
  - (B) It will never equal the firm's marginal cost.
  - (C) It will decline when the firm's marginal product declines.
  - (D) It will be negative if marginal revenue declines.
  - (E) It will equal average total cost when fixed costs are zero.

Questions 23-24 refer to the graph below showing cost curves for a perfectly competitive firm.



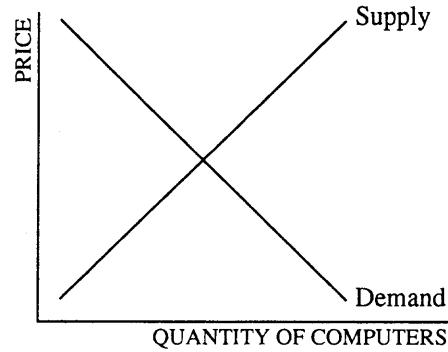
23. At a market price of \$6, the profit-maximizing rate of output will result in
- (A) economic profits
  - (B) economic losses
  - (C) normal profits
  - (D) profits that are less than normal
  - (E) profits that are greater than normal
24. If the market price is \$10, how many widgets should this profit-maximizing firm produce?
- (A) 3,000
  - (B) 6,000
  - (C) 12,000
  - (D) 16,000
  - (E) 21,000

25. A competitive firm produces a product using labor and plastic. The firm is initially in equilibrium. If the cost of plastic suddenly increases, which of the following will occur?
- The demand curve for the product will shift to the left.
  - The firm's demand curve for plastic will shift to the left.
  - The firm will increase the number of units offered for sale.
  - The firm will definitely go out of business, since competitive firms earn zero economic profits in equilibrium.
  - The firm's marginal costs will increase at each level of output.
- 
- 
27. Which of the following are characteristics of a perfectly competitive industry?
- New firms can enter the industry easily.
  - There is no product differentiation.
  - The industry's demand curve is perfectly elastic.
  - The supply curve of an individual firm in the industry is perfectly elastic.
- I and II only
  - I and III only
  - II and IV only
  - I, II, and IV only
  - I, III, and IV only
28. The profit-maximizing output level produced by an unregulated monopoly is
- the socially optimal output level, since the firm's marginal revenue equals its marginal cost
  - greater than the socially optimal level, since the firm's marginal cost exceeds its marginal revenue
  - greater than the socially optimal level, since the firm makes economic profits
  - less than the socially optimal level, since the price paid by consumers exceeds the firm's marginal cost
  - less than the socially optimal level, since the price of the product is less than the firm's marginal revenue

26. Given the cost and demand schedules depicted above, if the firm increased output from  $q_1$  to  $q_2$ , it would

- earn a normal profit
- experience an increase in profits
- experience a decline in profits
- increase revenues but not costs
- increase costs but not revenues

29. The wage rate is \$10 per hour and the last worker hired by the firm increased output by 100 units. Computers rent for \$100 per hour and the last computer rented by the firm increased output by 2,000 units. To minimize costs the firm should
- hire more workers and rent more computers because the marginal revenue products of both workers and computers are greater than their respective prices
  - hire more workers and reduce the number of computers rented because workers are cheaper than computers
  - lay off workers and rent more computers because computers produce more output per dollar of additional expenditure
  - lay off workers and rent more computers because computers produce more output
  - keep the same number of workers and computers because the marginal revenue products of both workers and computers are positive
30. Imposing taxes that increase as a firm's pollution increases is often recommended by economists as a means to reduce pollution. The reason for this recommendation is that such taxes would likely
- eliminate pollution completely
  - encourage firms to use the most efficient method to reduce pollution
  - increase the government's revenues
  - encourage firms to increase production
  - be paid out of firms' profits and not paid for by higher consumer prices
31. The opportunity cost of owning a business is equal to which of the following?
- The economic profits earned in the business
  - The accounting profits earned in the business
  - The profits that could be earned in another business using the same amount of resources
- I only
  - II only
  - III only
  - I and III only
  - I, II, and III
- 



32. The graph above shows the supply and demand curves for a particular brand of computers. In 1988, 10,000 computers were sold for \$1,000 each, but in 1989, 9,000 computers were sold for \$1,000 each. Which of the following changes in the supply and demand curves could most likely have caused this change?

<u>Demand Curve</u>	<u>Supply Curve</u>
(A) Shift right	Shift right
(B) Shift right	Shift left
(C) No change	Shift left
(D) Shift left	Shift left
(E) Shift left	No change

33. If the minimum wage for teen-agers increased to a rate higher than their market equilibrium wage, what would be the effect on their wage and employment?

<u>Wage</u>	<u>Employment</u>
(A) Increase	No effect
(B) Increase	Increase
(C) Increase	Decrease
(D) Decrease	Increase
(E) Decrease	Decrease

34. If a store raises its prices by 20 percent and its total revenue increases by 10 percent, the demand it faces in this price range must be
- (A) inelastic
  - (B) elastic
  - (C) unit elastic
  - (D) perfectly elastic
  - (E) perfectly inelastic

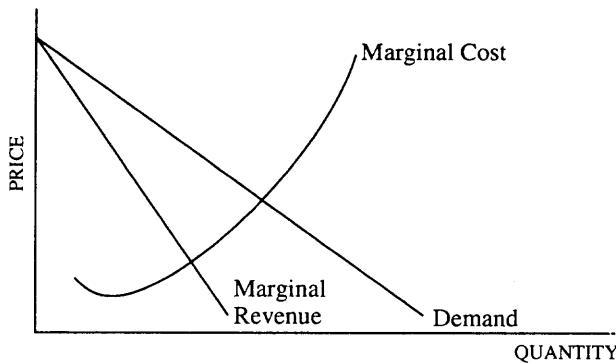
35. In which of the following market structures is it sometimes assumed that rival firms will match price decreases but not match price increases?
- (A) Perfect competition
  - (B) Oligopoly
  - (C) Natural monopoly
  - (D) Monopolistic competition
  - (E) Monopoly

36. A farmer produces peppers in a perfectly competitive market. If the price falls, in the short run the farmer should
- (A) increase production until the new price equals average revenue
  - (B) increase production to offset the fall in price
  - (C) discontinue production if the new price is less than marginal revenue
  - (D) continue to produce only if the new price covers average fixed costs
  - (E) continue to produce only if the new price covers average variable costs

37. Which of the following is true if a perfectly competitive market is in long-run equilibrium?
- (A) Market price will eventually decrease.
  - (B) New firms will enter the industry.
  - (C) Marginal revenue is equal to average total cost.
  - (D) Price is not equal to marginal revenue.
  - (E) Average variable costs are decreasing.
- 

UNITS OF OUTPUT					
		Units of Capital			
		1	2	3	
Units of Labor		1	100	140	160
		2	140	200	240
		3	160	240	300

38. The table above shows the various units of output that can be produced with different combinations of capital and labor. Which of the following statements is correct according to the information in the table?
- (A) In the long run, there are constant returns to scale.
  - (B) In the long run, there are increasing returns to scale.
  - (C) In the short run, the marginal product of capital is constant.
  - (D) In the short run, the marginal product of labor is constant.
  - (E) In the short run, the law of diminishing marginal returns does not hold.

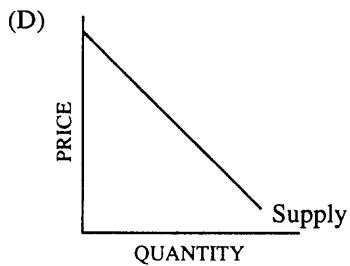
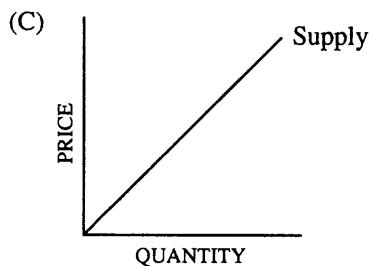
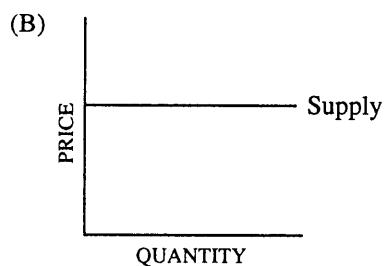
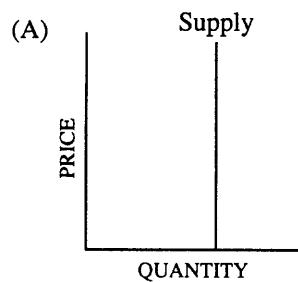


39. The graph above shows a firm's cost and revenue curves. This profit-maximizing firm will
- produce where demand is inelastic
  - charge a higher price than that necessary to maximize revenues
  - have many profit-maximizing price and quantity combinations
  - be unable to increase sales and total revenues by lowering its price
  - never have a region of falling average total cost
40. Which of the following is necessarily true of the profit-maximizing equilibrium of a monopolist who sets a single price?
- Price equals average total cost.
  - Price is greater than marginal cost.
  - Average total cost is at its minimum level.
  - Marginal revenue is greater than marginal cost.
  - Marginal cost is minimized.

<u>Number of Workers</u>	<u>Number of Sandwiches Produced per Day</u>
1	80
2	150
3	200
4	240
5	250
6	230
7	200

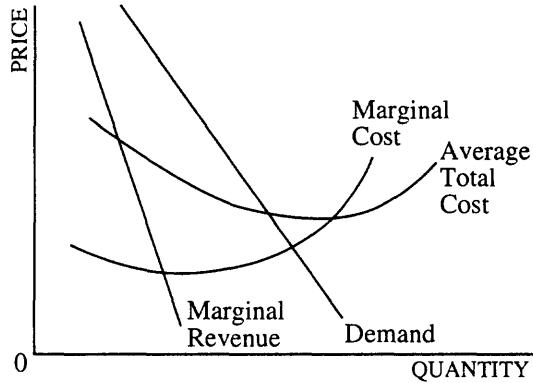
41. Given the production information in the table above, how many workers would be employed if the wage rate were \$20.00 per day and if sandwiches sold for \$0.50?
- 1
  - 2
  - 4
  - 5
  - 7
42. Which of the following is true when the production of a good results in negative externalities?
- The government must produce the good.
  - The private market will produce too little of the good.
  - The private market price will be too low.
  - The government must prevent the production of the good.
  - Private firms will not be able to maximize profits.

43. In the long run, a monopolistically competitive firm is allocatively inefficient because the firm will
- produce only when marginal cost is greater than marginal revenue
  - produce only when marginal revenue is greater than marginal cost
  - charge a price greater than the marginal cost
  - earn positive economic profits
  - experience economic losses
44. A change in which of the following will NOT cause a shift in the demand curve for a factor of production?
- Demand for the goods produced by the factor
  - Prices of the goods produced by the factor
  - Prices of substitute factors
  - Supply of the factor
  - Supply of substitute factors
45. There are negative externalities associated with the use of a freeway in a major city at rush hour because during this time
- drivers slow down other drivers because of the high traffic volume
  - drivers value their time more
  - government revenues from toll roads increase
  - revenues of bus companies increase
  - gasoline costs more
46. Economic growth can be depicted using a production possibilities curve by which of the following?
- A rightward shift of the curve
  - A movement upward on an existing curve
  - A movement downward on an existing curve
  - A movement from a point outside the curve to a point on the curve
  - A movement from a point on the curve to a point inside the curve
47. If a one-of-a-kind Etruscan vase is offered for sale at an auction, which, if any, of the following correctly shows the supply curve for the vase?



- (E) It is impossible to determine the shape of the supply curve from the given information.

48. Which of the following will cause an unregulated monopolist to produce a more allocatively efficient level of output?
- A tax based on the amount of profits
  - A tax that does not change as output increases
  - A tax that increases as output increases
  - A subsidy that increases as output increases
  - A subsidy that does not change as output increases
- 



49. The graph above shows the cost and revenue curves for a natural monopoly. Consider the following two policies for regulating this natural monopoly.

Policy I: Require the monopoly to set quantity and price where demand equals marginal cost.

Policy II: Require the monopoly to set quantity and price where demand equals average total cost.

Which of the following is true of these policies?

- Both would result in the same level of output and price.
- Both would result in an inefficient allocation of resources relative to the unregulated result.
- Policy I would result in a lower level of output than would Policy II.
- Policy I would result in a higher price than would Policy II.
- Policy I might require the payment of a subsidy to the firm.

50. Which of the following is true in the market for a certain product if producers consistently are willing to sell more at the going price than consumers are willing to buy?

- Demand is highly inelastic.
- Supply is highly elastic.
- The product is inferior.
- There is a price ceiling on the product.
- There is a price floor on the product.

51. According to the theory of consumer behavior, which of the following decreases first as additional units of a product are consumed?

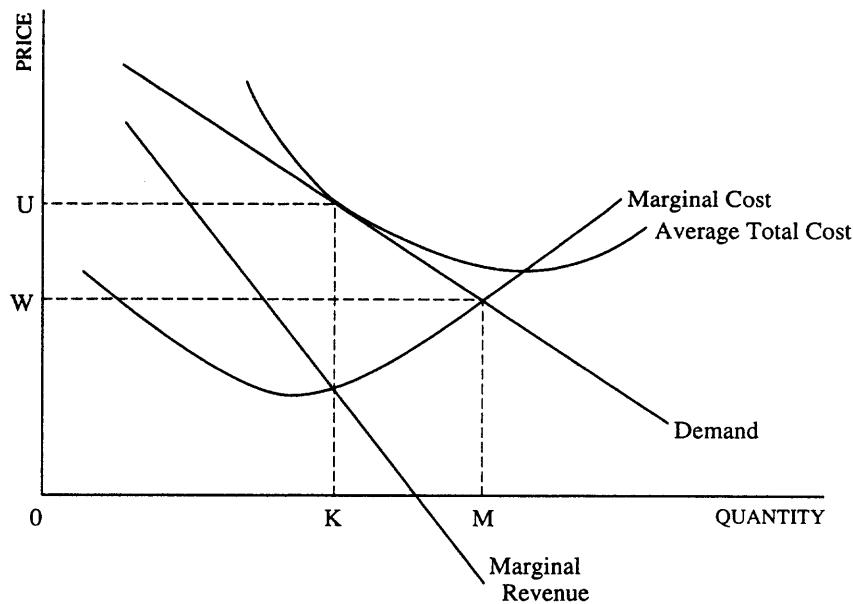
- Total utility
- Average utility
- Marginal utility
- Marginal physical product
- Total physical product

52. Under which of the following circumstances is a firm experiencing economies of scale?

- The firm increases only its labor input, and output decreases.
- The firm doubles its inputs, and output triples.
- The firm builds a new plant, and the average cost of production increases.
- The firm hires a new plant manager, and profits increase.
- The product price increases, and the firm increases its output.

53. Which of the following statements about cost is always true for both monopolies and perfectly competitive firms?

- Average total cost equals marginal cost when average total cost is a minimum.
- Marginal cost decreases as production increases.
- Average fixed cost is equal to marginal cost when average fixed cost is a minimum.
- Average variable cost is equal to marginal cost when marginal cost is a minimum.
- Average variable cost decreases as production increases.



54. The graph above depicts cost and revenue curves for a typical firm in a monopolistically competitive industry. Suppose that the firm is producing  $OQ_M$  units of output. To maximize profits, it should do which of the following to output and price?

<u>Output</u>	<u>Price</u>
(A) Increase	Decrease
(B) Increase	Increase
(C) Decrease	Increase
(D) Not change	Increase
(E) Not change	Not change

55. In most cases the supply curve for a perfectly competitive industry can be described as which of the following?
- (A) More elastic in the short run than in the long run
  - (B) More elastic in the long run than in the short run
  - (C) Downward sloping in the short run
  - (D) Perfectly inelastic in the long run
  - (E) Perfectly elastic in the short run
56. Compared with firms in a perfectly competitive industry, firms in a monopolistically competitive industry are inefficient because they
- (A) make economic profits in the long run
  - (B) do not lower the product price if input prices fall
  - (C) restrict their output level to maximize profits
  - (D) charge the highest price that consumers will pay
  - (E) waste resources by producing an excess amount of output
57. Which of the following is NOT a characteristic of monopolistically competitive markets?
- (A) Relatively easy market entry
  - (B) Differentiated products
  - (C) Substantial product advertising
  - (D) A large number of both buyers and sellers
  - (E) Long-run economic profits
58. Which of the following will happen in the labor market if the price of the good produced by the workers decreases?
- (A) The marginal product of labor will increase.
  - (B) The marginal product of labor will decrease.
  - (C) The marginal revenue product of labor will increase.
  - (D) The marginal revenue product of labor will decrease.
  - (E) The demand curve for labor will shift to the right.
59. Assume that a firm is hiring labor in a perfectly competitive labor market. If the marginal revenue product of labor is greater than the wage rate, which of the following will be true?
- (A) The firm must be losing money.
  - (B) The firm should employ more workers.
  - (C) The firm should replace workers with capital.
  - (D) The firm is maximizing its profits.
  - (E) The firm is experiencing diminishing marginal utility.
60. Which of the following is true of the marginal cost of providing a pure public good to one more consumer?
- (A) It is positive.
  - (B) It is equal to zero.
  - (C) It is equal to the original cost of the good.
  - (D) It decreases as the number of consumers increases.
  - (E) It increases as the number of consumers increases.

END OF SECTION I

**The College Board**  
**Advanced Placement Examination**

**MICROECONOMICS**

**SECTION II**

**Time — 50 minutes**

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## MICROECONOMICS

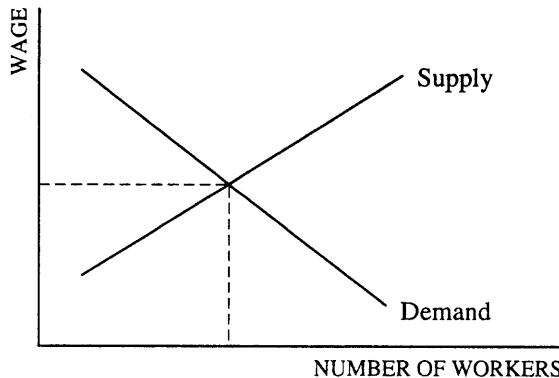
### SECTION II

Time — 50 minutes

**Directions:** You have fifty minutes to answer all three of the following questions. It is suggested that you take a few minutes to plan and outline each answer. Spend approximately half your time on the first question and divide the remaining time equally between the next two questions. In answering the questions, you should emphasize the line of reasoning that generated your results; it is not enough to list the results of your analysis. Include diagrams, if useful, in explaining your answers. All diagrams should be clearly labeled.

1. Peaches and nectarines are substitute goods, and both are produced under conditions of competitive long-run equilibrium.
  - (a) Joyce, a producer in the peach industry, discovers a technological breakthrough that only reduces the cost of producing peaches. Explain how the change in technology will affect each of the following for Joyce.
    - (i) Quantity of peaches produced
    - (ii) Price of peaches
    - (iii) Short-run profits
  - (b) Now assume that all other peach-producing firms adopt the new technology. Explain how the adoption of the new technology will affect each of the following in the peach-producing industry.
    - (i) Price of peaches
    - (ii) Quantity of peaches produced
  - (c) This new technology is not applicable to the production of nectarines. Explain how the changes that occurred in the peach industry will affect each of the following in the nectarine industry.
    - (i) Price of nectarines
    - (ii) Quantity of nectarines

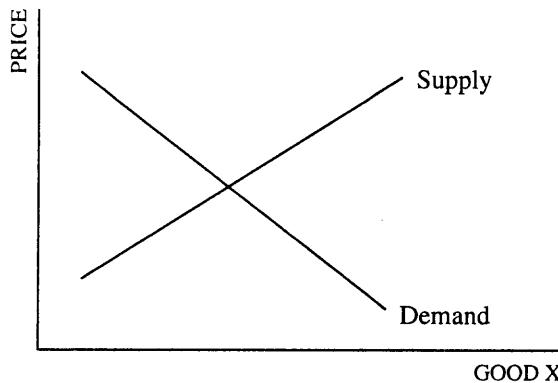
LABOR MARKET FOR NECTARINE WORKERS



- (d) The graph above depicts the supply and demand curves for workers in the nectarine industry before the technological breakthrough in the peach industry.

Explain how the technological breakthrough in the peach industry will affect each of the following in the labor market for nectarine workers.

  - (i) Wage rate for nectarine workers
  - (ii) Number of nectarine workers hired



2. Production of good X imposes costs on people who are neither producers nor consumers of good X.
- A senator proposes a per unit sales tax on good X. Explain how this tax will affect each of the following.
    - The price paid by consumers
    - The quantity of good X produced
    - The total after-tax revenues received by producers of good X
  - Explain how imposing this tax might result in greater economic efficiency than would be achieved in an unregulated competitive market.
3. (a) Identify the relationship between price and marginal revenue and explain why this relationship exists for each of the following.
- A perfectly competitive firm
  - Monopoly
- (b) A firm's market power is sometimes measured by using the following formula

$$\frac{(P-MC)}{P}$$

where  $P$  is price and  $MC$  is marginal cost at the profit-maximizing output level. Some economists claim the larger the value of the index, the greater the firm's market power.

- Explain why this index is always positive for an imperfectly competitive market.
- Using the formula, calculate the market power of any perfectly competitive firm.

END OF EXAMINATION

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# Chapter III

## Answers to the 1995 AP Microeconomics Examination

### ■ SECTION I: MULTIPLE-CHOICE

Listed below are the correct answers to the multiple-choice questions and the percentage of AP candidates who answered each question correctly. An answer

sheet gridded with the correct responses appears on the next page.

Section I Answer Key and Percent Answering Correctly

Item No.	Correct Answer	Percent Correct	Item No.	Correct Answer	Percent Correct	Item No.	Correct Answer	Percent Correct
1	E	72%	21	E	32%	41	C	55%
2	D	82%	22	E	70%	42	C	70%
3	A	67%	23	C	75%	43	C	83%
4	E	68%	24	D	72%	44	D	63%
5	A	62%	25	E	67%	45	A	65%
6	C	84%	26	C	41%	46	A	52%
7	D	58%	27	A	42%	47	A	51%
8	A	83%	28	D	47%	48	D	40%
9	D	71%	29	C	66%	49	E	24%
10	B	71%	30	B	89%	50	E	57%
11	D	89%	31	C	88%	51	C	51%
12	A	88%	32	D	67%	52	B	33%
13	C	48%	33	C	84%	53	A	58%
14	E	55%	34	A	56%	54	C	16%
15	A	61%	35	B	59%	55	B	64%
16	B	60%	36	E	53%	56	C	50%
17	B	92%	37	C	69%	57	E	45%
18	D	61%	38	A	29%	58	D	61%
19	B	62%	39	B	45%	59	B	31%
20	B	74%	40	B	57%	60	B	32%

**PLACE AP®  
NUMBER  
LABEL HERE.**

**A  
SIGNATURE**

To maintain the security of the exam and the validity of my AP grade, I will allow no one other than myself to see the multiple-choice questions and will seal the appropriate section when asked to do so. In addition, I am aware of and agree to the Program's policies and procedures as outlined in the 1995 AP Bulletin for Students and Parents.

**Sign your name as it will appear on your college applications**

B. YOUR AP NUMBER			C. NAME	Omit spaces, hyphens, apostrophes, Jr. or II.		MI
			Last Name - first 15 letters	First Name - first 12 letters		
0	0	0	A	A	A	
1	1	1	B	B	B	
2	2	2	C	C	C	
3	3	3	D	D	D	
4	4	4	E	E	E	
5	5	5	F	F	F	
6	6	6	G	G	G	
7	7	7	H	H	H	
8	8	8	I	I	I	
9	9	9	J	J	J	
D. ADMIN. DAY IN MAY	E. TIME OF DAY		K	K	K	
	6 AM		L	L	L	
0	7 AM		M	M	M	
1	8 AM		N	N	N	
2	9 AM		N	N	N	
3	10 AM		N	N	N	
4	11 AM		S	S	S	
5	12 PM		T	T	T	
6	1 PM		U	U	U	
7	2 PM		V	V	V	
8	3 PM		W	W	W	
9	4 PM		X	X	X	
	5 PM		Y	Y	Y	
			Z	Z	Z	

**F. AP EXAMINATION(S) TO BE TAKEN USING THIS ANSWER SHEET**

Print examination name: Economics: Micro

Fill in the appropriate oval below for examination name and number.

- |    |                     |    |                         |    |                    |
|----|---------------------|----|-------------------------|----|--------------------|
| 07 | U.S. History        | 36 | Eng. Language & Comp.   | 66 | Math: Calculus AB  |
| 13 | Art: History of     | 37 | Eng. Literature & Comp. | 68 | Math: Calculus BC  |
| 14 | Art: Studio Drawing | 43 | European History        | 75 | Music Theory       |
| 15 | Art: Studio General | 48 | French Language         | 78 | Physics B          |
| 20 | Biology             | 51 | French Literature       | 80 | Physics C: Mech.   |
| 25 | Chemistry           | 55 | German Language         | 80 | Physics C: E & M   |
| 31 | Computer Science A  | 57 | Gov. & Pol.: U.S.       | 85 | Psychology         |
| 33 | Computer Science AB | 58 | Gov. & Pol.: Comp.      | 87 | Spanish Language   |
| 34 | Economics: Micro    | 60 | Latin: Vergil           | 89 | Spanish Literature |
| 35 | Economics: Macro    | 60 | Latin Literature        |    |                    |

**H. DO NOT COMPLETE THIS SECTION UNLESS INSTRUCTED TO DO SO.**

## **H1. Essay Choices**

**Fill in the ovals under the numbers  
of the essay questions you  
answered in this examination.**

- 1   2   3   4   5   6   ... in a country where the language of the exam you  
 0   0   0   0   0   0   are now taking is spoken?    Yes    No

7   8   9   10   11   12   2. Do you regularly speak or hear the language at home?    Yes    No  
 0   0   0   0   0   0

**G. What language do you know best?**

- English
  - English and another language about the same
  - Another language

SCHOOL USE ONLY

<b>SCHOOL USE ONLY</b>	
<b>Fee Reduction Granted</b>	<b>①</b>
○	<b>②</b>
	<b>③</b>
	<b>④</b>
	<b>⑤</b>
	<b>⑥</b>
	<b>⑦</b>
	<b>⑧</b>
	<b>⑨</b>

**BE SURE EACH MARK IS DARK AND COMPLETELY FILLS THE INTENDED SPACE. IF A QUESTION HAS ONLY FOUR ANSWER OPTIONS, DO NOT MARK THE OPTION E.**



Advanced Placement Program®  
**THE COLLEGE BOARD**  
Master ID/Answer Sheet (MIDAS) for May 1995 Form 3RBM

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## ■ SECTION II: FREE-RESPONSE

### Report of the Chief Faculty Consultant

Rae Jean Goodman

United States Naval Academy

### The Development of Free-Response Questions

The first step in developing the free-response section of an AP Microeconomics Exam is taken two years before the exam is administered, when committee members discuss the topic areas that have been covered in the recent past exams and decide which topic areas should be covered in the exam under construction. Each member selects questions for consideration by the whole committee.

From the proposed questions, in conjunction with the focus topic areas, the committee selects free-response questions for use in the AP Exam. The committee members discuss what information and economic analysis are important for a student to know for each particular question. The questions are then rewritten to conform to the consensus of the committee.

In preparation for the next committee meeting, each member prepares answers to the free-response questions. The committee as a whole discusses these answers and rewrites portions of a question if necessary. At this point, if there is consensus that a question is "just not working," the committee will seek a replacement question. The revised questions are put through the same process at the next committee meeting; further adjustments and refinements are made at this time.

The free-response questions are answered and discussed at two more meetings of the committee; it is then that the committee forms possible grading standards. The questions are then administered in May to AP candidates. As an example, the time line for the free-response questions of the 1997 AP Microeconomics Exam is:

Initial question selection	Spring 1995
First Review and Rewrite	Fall 1995
Second Review and Rewrite	Spring 1996
Third Review and Preliminary Standards	Fall 1996
Standards Proposed	Spring 1997
Exam Administered	May 1997

This process provides reasonable assurance that important topic areas will be covered, questions will offer sufficient direction without being overly prescriptive, and few free-response questions will "not work" when administered to the AP candidates.

### Setting and Maintaining Standards

The development of the standards and procedures to ensure consistent grading of the free-response sections of AP Examinations is vital to the success of the AP Program and acceptance of AP scores by colleges and universities. The goal of the process is to have all faculty consultants evaluate the students' responses fairly, uniformly, and according to the standards.

Prior to the June Reading, the chief faculty consultant uses the AP Economics Development Committee's input and samples of actual student responses to draft grading standards and point allocation for each free-response question. Two days before the Reading begins, the chief faculty consultant, table leaders, and consultants from Educational Testing Service meet at the Reading site. The table leaders review a set of sample student answers that they have received and develop ideas about the scoring standards to apply to those answers.

The table leaders for the microeconomics questions, along with the chief faculty consultant and ETS consultant, review and revise the preliminary standards and point allocation. The standards are then applied to a sample of actual student answers. Scores are then assigned, by consensus, to these answers. This set of scoring standards will be used to train faculty consultants in evaluating student responses.

The chief faculty consultant, microeconomics and macroeconomics table leaders, and ETS consultants meet to discuss and review the scoring standards for all AP Economics free-response questions. In general, the final wording of the scoring standards is completed at this time.

Following an introductory meeting, the Reading begins with a training session for all faculty consultants. Here, they learn to consistently apply a single set of scoring standards to each question. The faculty consultants are divided into groups of five to eight among table leaders. The table leader provides each faculty consultant with a set of student responses and the scoring standard for the question which will be read by the particular table; several tables may score a single question.

The table leader and faculty consultants discuss the question and the correct answer to the question. The scoring standard is explained and discussed, after which the faculty consultants apply the standard to the set of sample student responses. Scores for the samples are then compared and discussed. At this point, the faculty consultants are learning the various levels of student ability which are reflected in the answers and the range of nuances consistent with each score.

The next step in the process is a “round robin”: each faculty consultant is given an exam; everyone scores each exam; the scores are discussed and compared; and a consensus is reached. If there is more than one table scoring a question, the round robin is performed across the table to ensure that all faculty consultants scoring a particular question are applying the same standard. The goal is a consistent and reliable application of the standards.

The original training is reinforced and checked in three ways. First, at the beginning of the second day of the Reading, a round-robin check is performed for each question. This confirms that all the faculty consultants have retained the scoring standard training. Throughout the remainder of the Reading, at a rate of once a day, two additional types of checks are carried out: a self-check and a table-leader check. In a self-check, each faculty consultant is asked to rescore a set of between three and five selected papers that he or she has previously scored, without seeing the original scores. When differences occur, the faculty consultant reconsiders the final score in consultation with the table leader. A table-leader check involves the table leader rescoring exams already scored by faculty consultants at the table. Once again, when discrepancies occur, the table leader and faculty consultant confer. Many times these discussions expand to include all the faculty consultants at the table and the occasion is used as a learning experience.

Throughout the training and the Reading, the faculty consultants are reminded of several guiding principles. They are encouraged to use the full range of the scoring scale. They are reminded that the highest score should be applied to excellent, not necessarily perfect, responses. Faculty consultants are trained to discuss a problematic student response with either other consultants at the table or the table leader.

As in all AP scoring procedures, the faculty consultant does not know the name of the student nor his or her scores for other questions on the exam. A faculty consultant evaluates only one question on a particular

student's exam. All of these measures are designed to provide fair and consistent scoring of a student's responses.

## **The Reading**

In June of 1995, 37 secondary school, college and university economics teachers met at Trenton State College in Trenton, New Jersey, to read and evaluate over 9,700 responses written by AP Microeconomics candidates. The faculty consultants are experienced economics instructors of either undergraduate introductory economics courses or of AP courses in secondary schools. Approximately 10 percent of them were new to the AP Reading in 1995. The faculty consultants reflect the different geographic regions, types of institutions, and racial and ethnic groups of the candidates and institutions which participate in the AP Program.

The microeconomics faculty consultants were divided into three groups, each assigned to read one of the three essays. The largest number, nineteen, were allotted to read the long micro question; nine were allocated to read Question 2, and nine were assigned to Question 3. The aim of the chief faculty consultant is to distribute the faculty consultants in the correct proportion so that any one reader scores only one question throughout the Reading. If this objective is met, the reliability of the evaluation should be maintained because consensus on the reading standards will be reached among fewer people, and the Reading will be more efficient because time will not be taken to retrain faculty consultants to score a second question.

## **General Comments**

This is the third year of the three-question format for the AP Microeconomics Examination. There was agreement that the questions were generally of high quality and difficulty, but at the same time were fair and addressed content that is fundamental to microeconomics principles courses in universities and colleges nationwide; the procedures for evaluation were well developed and carefully implemented. The questions focused on relevant subjects and required basic microeconomic analysis. The long question involved firm and market analysis for a perfectly competitive market in long-run equilibrium; the second question used supply and demand analysis to examine the effects of a tax on a product with negative externalities, and

the implications for economic efficiency; and the third question focused on monopoly and perfect competition models and their relationships.

On this year's AP Microeconomics Exam, as well as in previous years, students experienced difficulty with the monopoly model of the firm, with explaining why the marginal revenue curve lies below the demand curve, and with the relationship between product price and the marginal revenue product curve for a factor input. Although the number of students able to demonstrate an understanding of the monopoly model has increased over the seven years of the AP Microeconomics Exam, the monopoly model still needs to be reinforced. Students should understand that the reason that the marginal revenue curve under monopoly differs from the marginal revenue curve under perfect competition is due to the fact that if the monopolist wants to sell an additional unit, the price on that unit *and all previous units* must decline. A second area of difficulty for students is the relationship between the product market and the factor input market. The effect of a product price change on the marginal revenue product curve is not grasped by a large number of students taking the AP Microeconomics Exam. The reason for the shift in the demand for an input in

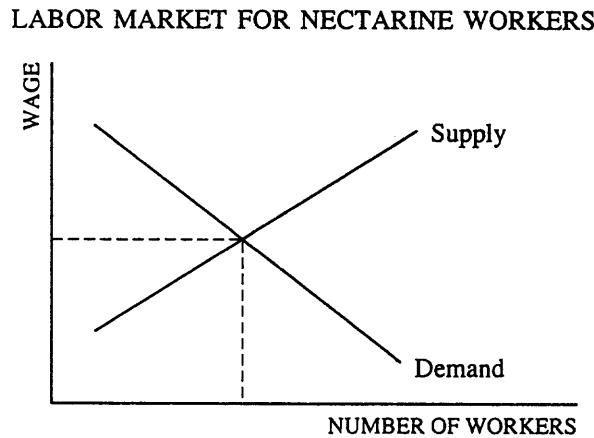
response to a change in product price is due to the change in the marginal revenue product curve. If the demand for the product decreases resulting in a decrease in product price, the marginal revenue product curve for an input, say labor, will shift to the left. There are consequences for the equilibrium wage rate and level of employment.

Graphical analysis is an important tool for economists and thus the better answers usually use graphs to supplement the verbal analysis. Through 1995, graphical analysis was not required in the AP Microeconomics Exam, although in the scoring process, graphs could help a student. If a student graphically demonstrated correct knowledge which was not discussed in the verbal presentation, the student received credit. Beginning in 1996, graphical analysis may be required on the AP Microeconomics Exam.

The sample student responses that follow are reproduced in their original format, unedited for grammar, spelling or punctuation. All are used with the permission of the students, who understood that their responses might be published at a later date. When reading these responses, keep in mind that they were written under exam conditions and within a time constraint.

## Free-Response Question 1

1. Peaches and nectarines are substitute goods, and both are produced under conditions of competitive long-run equilibrium.
  - (a) Joyce, a producer in the peach industry, discovers a technological breakthrough that only reduces the cost of producing peaches. Explain how the change in technology will affect each of the following for Joyce.
    - (i) Quantity of peaches produced
    - (ii) Price of peaches
    - (iii) Short-run profits
  - (b) Now assume that all other peach-producing firms adopt the new technology. Explain how the adoption of the new technology will affect each of the following in the peach-producing industry.
    - (i) Price of peaches
    - (ii) Quantity of peaches produced
  - (c) This new technology is not applicable to the production of nectarines. Explain how the changes that occurred in the peach industry will affect each of the following in the nectarine industry.
    - (i) Price of nectarines
    - (ii) Quantity of nectarines



- (d) The graph above depicts the supply and demand curves for workers in the nectarine industry before the technological breakthrough in the peach industry.

Explain how the technological breakthrough in the peach industry will affect each of the following in the labor market for nectarine workers.

  - (i) Wage rate for nectarine workers
  - (ii) Number of nectarine workers hired

## **Question 1 Scoring Guide**

Basically, the point distribution is 3 points for Part (a); 2 for Part (b); 2 for Part (c), and 2 for Part (d).

### **Part (a): 3 points**

The technological breakthrough which reduces the costs of producing peaches lowers the average total cost curve and the marginal cost curve, resulting in a greater output at the same price. The reduction in average costs, the increase in Joyce's production, and the price remaining constant combine to increase short-run profits.

Points:

- 1 – An explanation that costs have decreased, shifting the MC cost curve and resulting in a new profit-maximizing higher level of output.
- 1 – Price remains constant because of perfect competition. Thus, Joyce cannot affect the market price.
- 1 – The student must show convincingly that short-run profits increase. One of the following explanations is acceptable:
  - Price is constant and costs decrease.
  - Costs have decreased while total revenue has increased due to constant price and increased output.
  - If the student has indicated above that the price has decreased, then the student must argue that average costs decrease more than the price decreases (or equivalent) to get an increase in Joyce's profits.

### **Part (b): 2 points**

The new technology spreads to the entire peach industry resulting in a rightward shift of the industry supply curve. Price decreases and quantity increases.

Points:

- 1 – For indicating that the industry supply curve shifts to the right; graphically or verbally.
- 1 – For equilibrium price and quantity effects. A  $\frac{1}{2}$  point for price decrease and a  $\frac{1}{2}$  point for quantity increase.

### **Part (c): 2 points**

Given that peaches and nectarines are substitutes, a decrease in the price of peaches results in a decrease in the demand for nectarines. A leftward shift in the demand curve for nectarines results in a decrease in the equilibrium price and quantity.

Points:

- 1 – A decrease in demand resulting from the price decrease in peaches and the fact that peaches and

nectarines are substitutes. The reason must be given.

- $\frac{1}{2}$  – Decrease in nectarine equilibrium price.  
 $\frac{1}{2}$  – Decrease in nectarine equilibrium quantity.

### **Part (d): 2 points**

The decrease in the price of nectarines results in  $MRP_L$  declining, or a leftward shift of the labor demand curve. The result is a decrease in wages and in the number of laborers hired. Must link product price decline to the decrease in demand for labor. (The use of the term "derived demand," or indicating that product Q decreases  $\Rightarrow$  need for labor decreases, is inadequate.)

Points:

- 1 – Leftward shift in demand curve due to decrease in  $MRP_L$  or, possibly,  $VMP_L$ ; the student must link the price change in the product market to the demand change in the labor market.
- $\frac{1}{2}$  – Wage rate declines.
- $\frac{1}{2}$  – Quantity of labor hired decreases.

After the faculty consultant has finished allocating the points, the answer is looked at as a whole and ultimately judged by its overall quality. This is especially true if the score includes a  $\frac{1}{2}$  point. A score of 8 or 9 should reflect an excellent answer; 6 and 7, a good answer; 4 and 5, an adequate answer; 3, a seriously deficient answer, but still an answer; 2, answers that are lots of words signifying nothing except one sustained relevant argument; 1, a correct, relevant-to-the-question statement; 0, no relevant economic answer to the question. Using the holistic approach, the 1 or 2 is a "bottom up" approach.

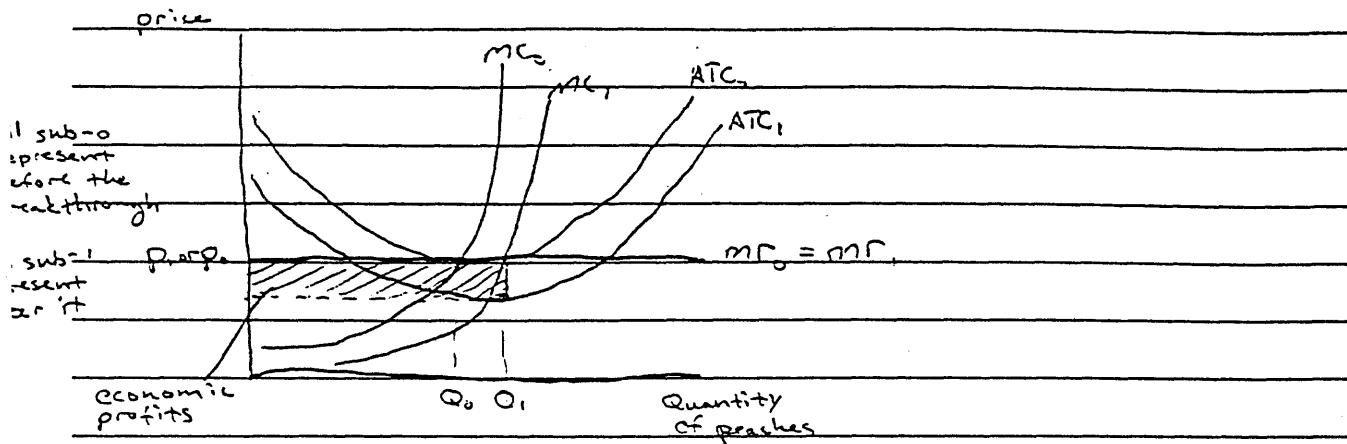
## **Overall Comment on Question 1**

This question deals with changes to variable costs in a perfectly competitive market, the interaction between market changes and complementary goods, and the interaction of factor market changes with product market changes. The students appear to understand the basic supply and demand model very well and can explain the interaction between the market changes of complementary goods. This question discriminates well among the higher level students by requiring students to recognize the difference between firm and market analyses, and recognize explicitly that the decrease in the product price reduces the marginal revenue product for labor.

## Sample Student Responses

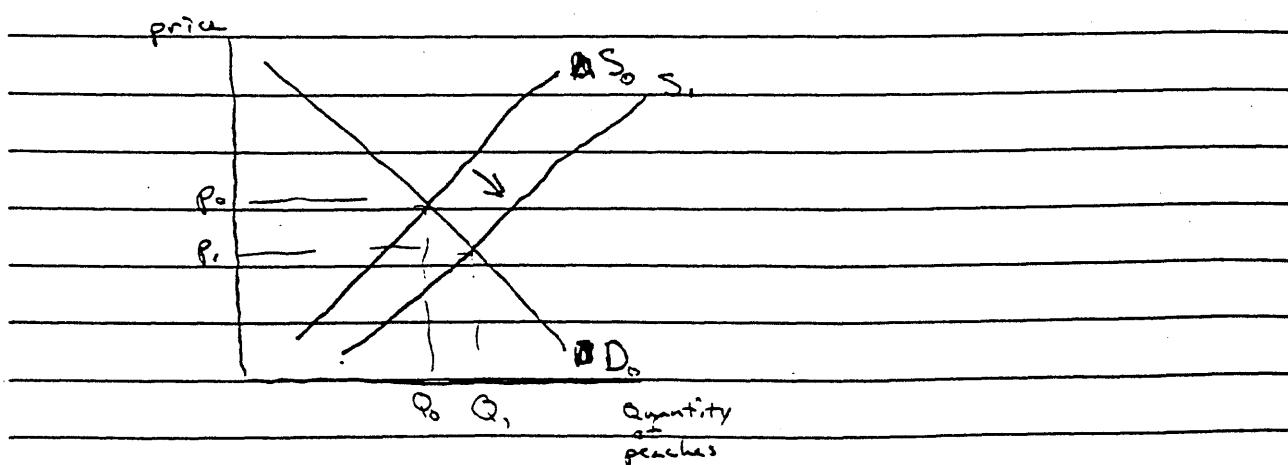
### Student Response 1 (score of 9)

For Joyce in the short run:



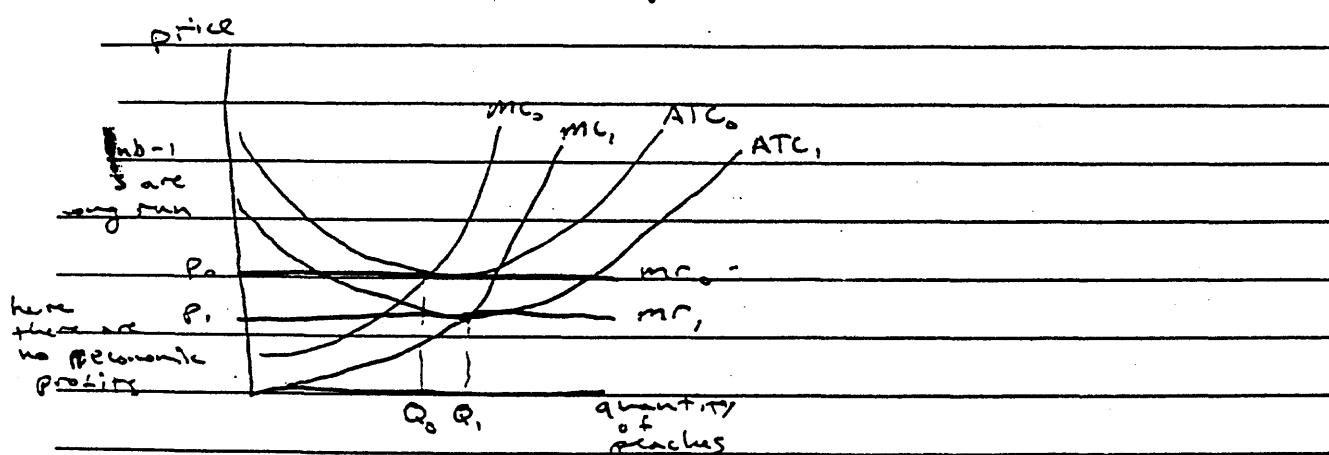
As the graph shows, Joyce will be able to charge the same price for the peaches because the other producers don't yet have her new technology, and thus, must charge the higher price to break even. Also, Joyce's MC curve decreased for all levels of production, so, being a profit maximizer, she increased production  $\rightarrow$  where  $MC = MR$ . That means Joyce charges the price  $p_1$  and can produce that at this a point on the ATC curve lower than  $p_1$ , so she makes profits, as shown on the graph.

For the peach industry in the long run:

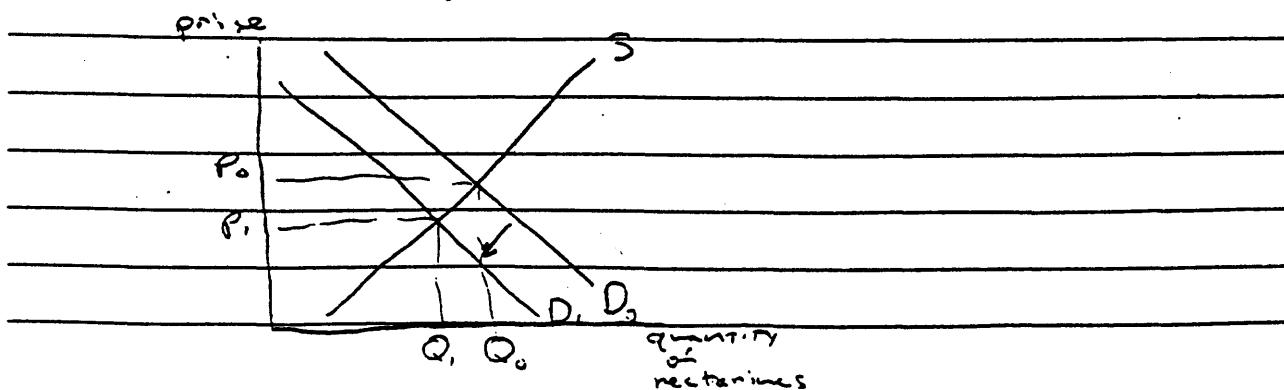


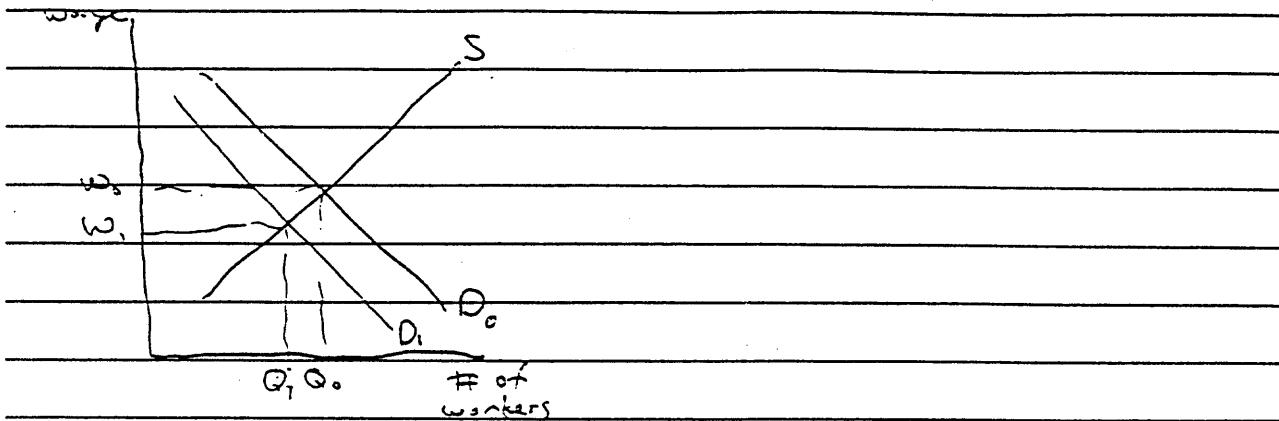
In the long run, when other firms adopt Joyce's technology, the price of peaches will fall so that it equals the minimum point on the new ATC curve for each firm. The quantity of peaches sold in the industry will increase, but we have no information that leads us to believe that new firms will enter the industry. ~~Each firm will produce more.~~

Joyce's Firm in the long run



Since peaches and nectarines are substitutes, a decline in the price of peaches will decrease the demand for nectarines, decreasing their price and quantity they bought.

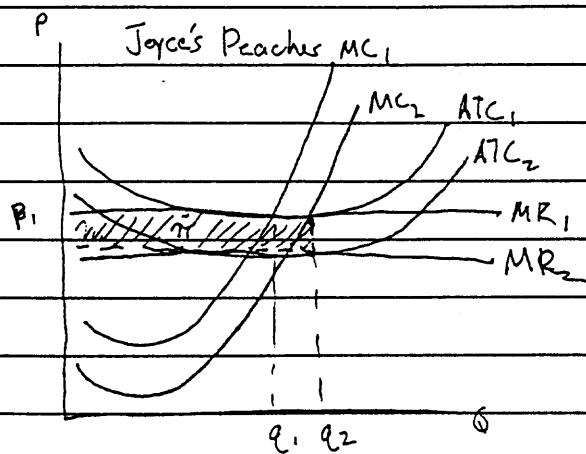




As the graph shows, the change in demand for the product will decrease its price which equals MR in a competitive industry. Since the demand for labor equals  $MRP = MR \cdot MP$ , a decline in ~~the~~ price will decrease the demand for workers, lowering their wage and the number hired. This is because factor demand is derived from product demand.

**Comment:** Excellent paper. The student clearly shows the change in the marginal cost (MC) and average total cost (ATC) curves for Part (a), while simultaneously recognizing that the industry was in long-run equilibrium (minimum point on ATC curve) and that the marginal revenue to Joyce does not change because the peach industry is perfectly competitive. In Part (b), the effects on the industry of the new technology are discussed and presented graphically. The effect of price changes on substitutes is captured well in the discussion and analysis of Part (c). The entire argument of how a change in product price translates into the labor market is concisely stated in Part (d). This essay is an excellent example of the use of graphical analysis to support the written work and of clear, concise analysis.

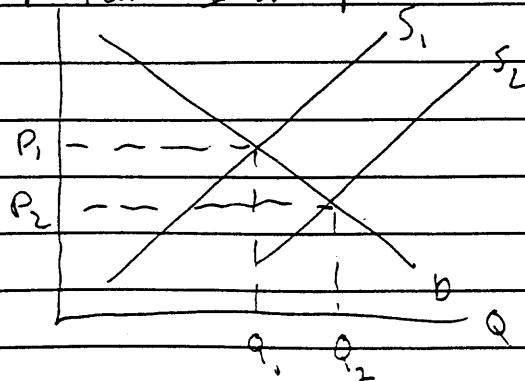
Student Response 2 (score of 8)



Joyce's new technology causes her marginal cost of producing each peach to decrease. Her marginal cost and average total cost curves shift downward. She is a price taker in perfect competition, so  $P$  and  $MR_1$  don't change. The new intersection of  $MR_1$  and  $MC_2$  corresponds <sup>to an increased quantity</sup>. Joyce earns a temporary economic profit. ( $\pi$ )

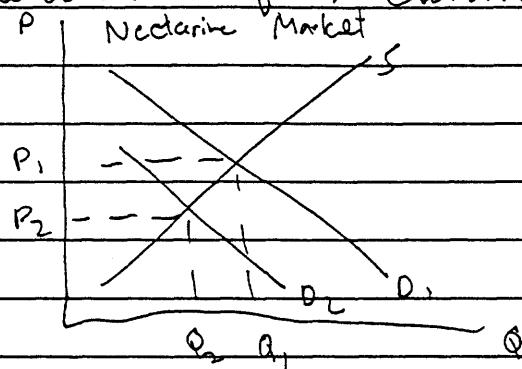
If all other producers adopt the technology, their costs will change similarly to Joyce's, resulting in economic profits. New firms enter the industry, attracted by the profits. Supply shifts outward.

e Peach Industry



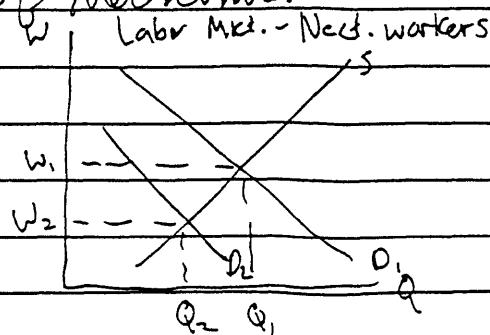
The price of peaches decreases to  $P_2$ , while the quantity increases to  $Q_2$ . At  $P_2$ , Joyce and other peach ~~farmers~~ ~~peach~~ and producers once again earn normal profits.

Since peaches and nectarines are substitutes, the decreasing price of peaches will cause a leftward shift in the demand for nectarines.



Both the price and quantity produced of nectarines decrease.

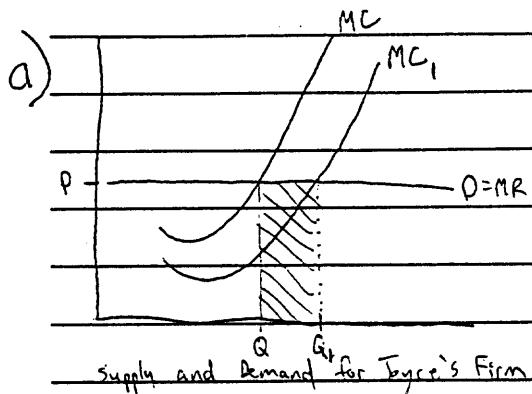
The demand for workers in the nectarine industry is a derived demand, meaning that it will decrease in response to the decrease in demand for the product, ~~for~~ nectarines. Fewer workers are needed to produce the smaller quantity of nectarines.



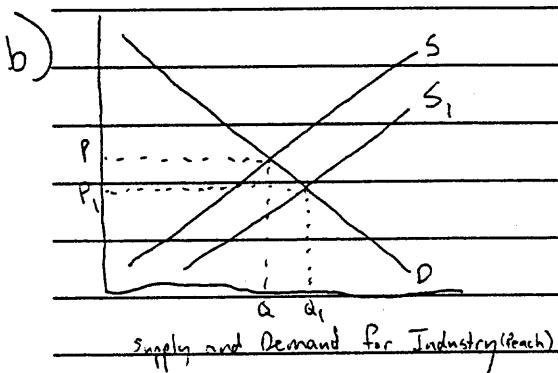
Both the wage rate and the quantity of nectarine workers hired will decrease.

**Comment:** Excellent paper. The student presents the analysis for Parts (a) - (c) succinctly, with some additional information that the industry would return to a new long-run equilibrium at a larger quantity and lower price. The student loses a point in Part (d) because the argument that the shift in demand for nectarine workers is due to a decrease in the marginal revenue product of labor is not presented.

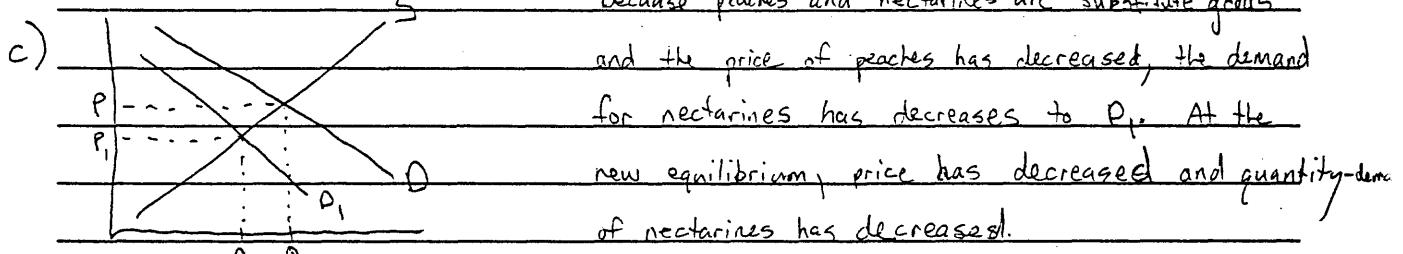
**Student Response 3 (score of 7)**



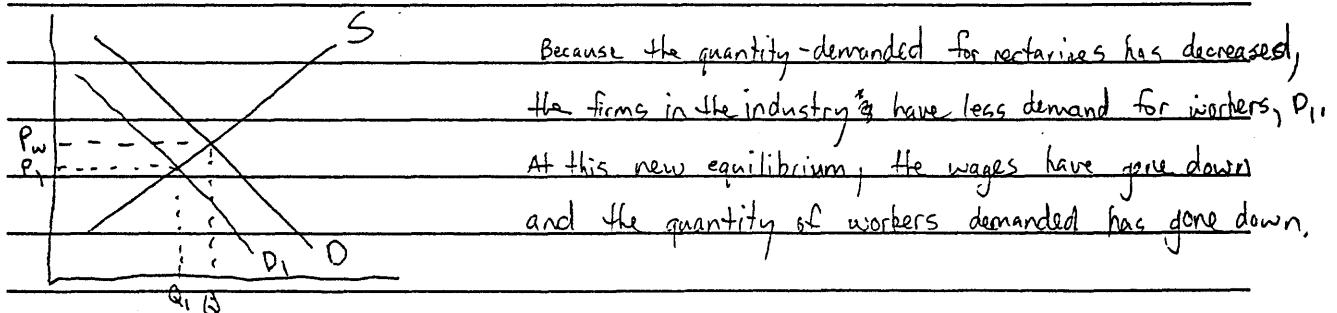
The cost of producing the peach will decrease, as given by  $MC_1$ . Therefore she will produce where price equals  $MC_1$ ,  $Q_1$ . The quantity of peaches produced increases. Because it is a perfectly competitive market, she will not realize a price increase or decrease. She will have an economic profit of  $P(Q_1 - Q)$ .



Because the cost of production decreases, the supply will increase to  $S_1$ . At the new equilibrium, the price will have decreased while the quantity demanded of peaches will have increased.



Supply and Demand for Nectarine Industry



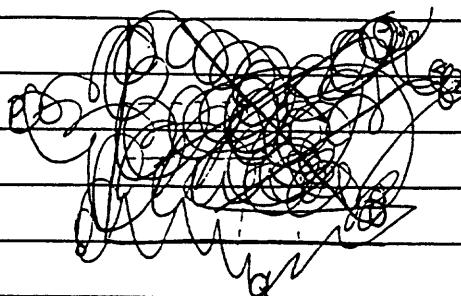
Labor Market for Nectarine Workers

**Comment:** This essay is an excellent example of the brevity possible when presenting economic analysis. The student does not include an average total cost (ATC) curve in the firm analysis and hence does not correctly identify the impact on Joyce's profits of the new technology. Parts (b) and (c) cover the main points of the answer. In Part (d), the correct argument for the decrease in demand for labor is the reduction in the marginal revenue product due to the decrease in nectarine prices. The student does not present the correct explanation although the wage and employment results are correct.

**Student Response 4 (score of 6)**

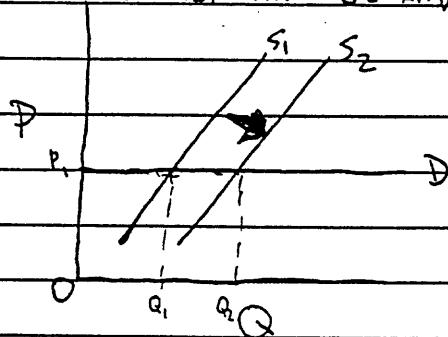
1.)

(a.)



(i) The quantity of peaches Joyce produces will increase due to the new technology.

SUPPLY AND DEMAND FOR JOYCE'S PEACHES

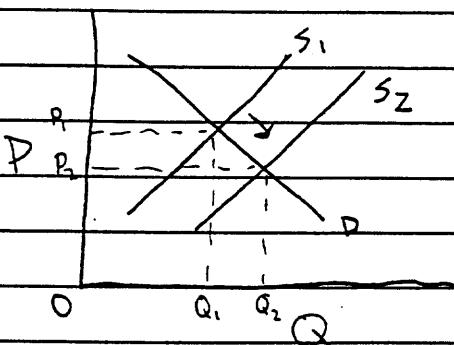


(ii) The price of peaches will remain constant because they are being sold in a perfectly competitive market.

(iii) Joyce's short run profits will increase because she is now selling a greater quantity of peaches at the same price which will cause an increase in total revenue.

(b.)

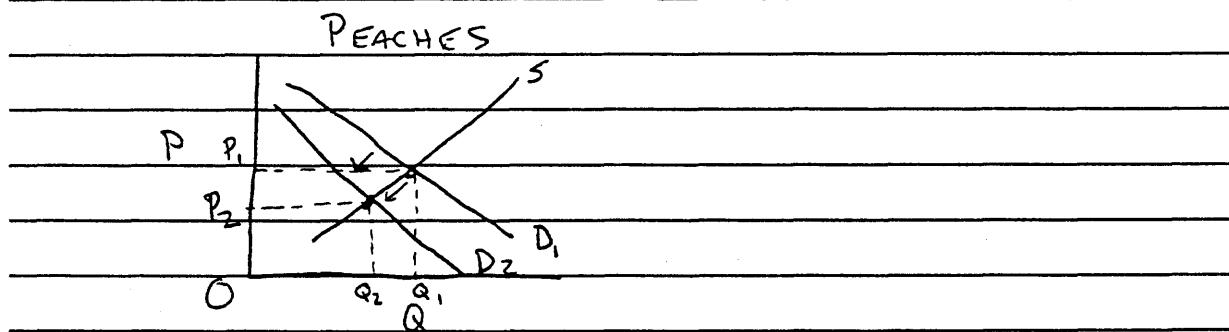
INDUSTRY SUPPLY AND DEMAND FOR PEACHES



(i) The price of peaches will decrease due to the increased supply and the fact that the industry demand line is downward sloping unlike the elastic demand lines for the individual firms in the industry.

(ii) The quantity of peaches produced by the industry will increase due to the technological advancement.

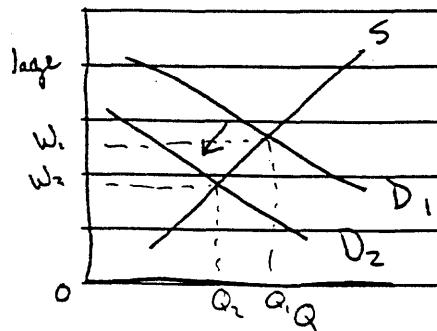
(c) (i) Because peaches and nectarines are substitute goods, the increased ~~peach~~ supply and reduced cost of peaches will cause a decrease in the demand of nectarines which will therefore cause a fall in the price as shown in the graph below.



(ii) The decreased demand for nectarines (as shown above) will cause a decrease in the quantity of nectarines demanded.

(d) ~~QUESTION~~

#### LABOR MARKET FOR NECTARINE WORKERS



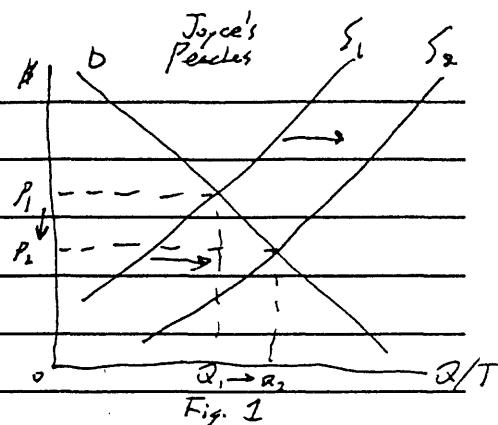
(i) The wage rate for nectarine workers will decrease due to a decreased demand for them caused by the decreased demand for the product which they produce.

(ii) The number of nectarine workers hired will also decrease due to the decreased demand.

**Comment:** The student does not distinguish between firm analysis and industry analysis. In Part (a), the student should be using firm analysis to discuss the effects of the new technology on the costs, revenue and profit of Joyce. Instead, the student uses supply and demand analysis. The student does recognize that the firm is a price-taker and, hence, that Joyce's product price does not change while the new technology allows an increase in output. Part (a) earns one point. For Parts (b) and (c), the student correctly utilizes supply and demand analysis and presents very cogent arguments to arrive at the results; the essay earns four points for these two parts. In Part (d), the student shows the correct shift in labor demand and identifies changes in wage rate and employment, but does not link the decrease in demand for nectarine workers to the impact of changes in the *price* of nectarines on the marginal revenue product of nectarine workers. The essay earns one point in Part (d).

**Student Response 5 (score of 5)**

(a) The reduction in cost of producing peaches sparks a shift to the right for the supply curve for peaches.



(i) As Fig. 1 shows, the quantity of peaches produced increases.

(ii) As Fig. 1 shows, the price of peaches falls.

(iii) Because other firms ~~have not~~ in the peach industry have not adopted the technology, Joyce is selling more peaches at a lower cost, so Joyce will be making positive short-run profits.

(b) Fig. 1 can also represent the whole industry's demand and supply of ~~peaches~~ peaches. Therefore, (i) the price of peaches falls, and (ii) the quantity of peaches produced rises.

(c) Because the price of peaches dropped more people will buy peaches and the demand curve for nectarines will shift to the left.

(Fig. 2) As Fig. 2 indicates, (i) the price of nectarines will fall and (ii) the quantity of nectarines produced will also fall.

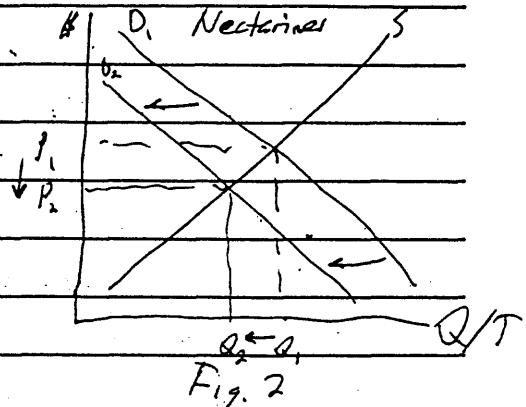


Fig. 2

(d) Because fewer nectarines are being produced, the fewer workers are needed, and the demand for workers shifts to the left.

As Fig. 3 indicates, (i) the wage rate for nectarine workers will fall and (ii) the number of nectarine workers hired will drop.

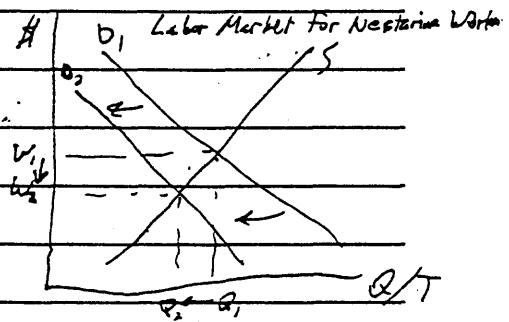
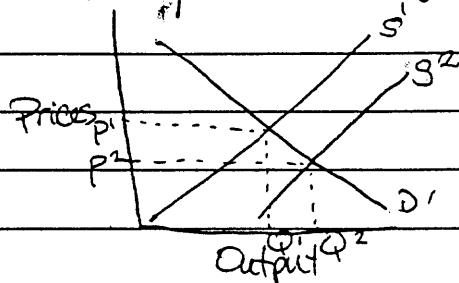


Fig. 3

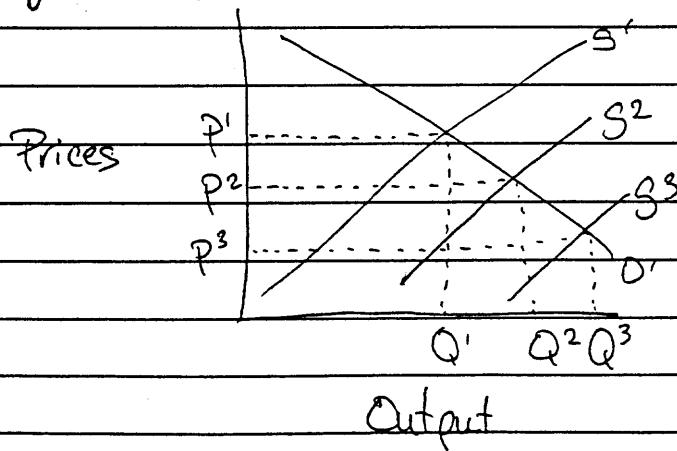
**Comment:** This essay earns no points in Part (a). The student uses supply and demand analysis to answer a question which relates to firm analysis; he or she does not appear to apply the assumptions that the peach industry is perfectly competitive and is operating in long-run equilibrium. The student arrives at the answers through incorrect analysis. Examples of incorrect analysis are the statement that the price of peaches declines with *only* Joyce having the new technology, and the assertion that because Joyce is selling more peaches at a lower cost, the short-run profits must be positive. Parts (b) and (c) earn full credit. The student earns only one point in Part (d) because the marginal revenue product argument is not given. This essay represents a typical or representative answer by students who know some microeconomics (supply and demand analysis) but do not have a sufficient grasp of the theory of the firm to be able to apply the theory.

**Student Response 6 (score of 4)**

With a change in a competitive, long run cost of production comes changes in quantity, prices, and profit levels. With the reduction in the cost of producing peaches, the quantity supplied would increase, the price would decrease, and short run profits would increase.



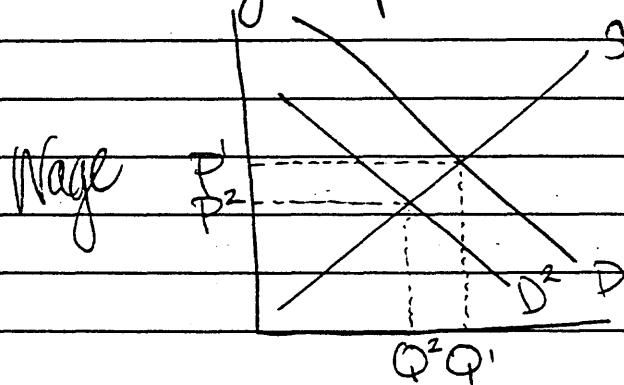
As in any competitive market industry structure, other firms recognize the possibility for profit and enter the market. This brings the price of peaches down even further, as well as increasing quantity, which brings the peach market to a new equilibrium.



Since peaches and nectarines are not considered complementary products (that is, one is necessary to enjoy the other), the changes in peach markets will not

directly affect nectarine sales. However, the two may be considered substitute goods (that is, one is a substitute for the other and the lowest priced product is usually more popular). If this is so, the new price of peaches will push the price of nectarines down and the quantity demanded down.

The labour market for nectarine workers will be affected by the peach market's changes as well.

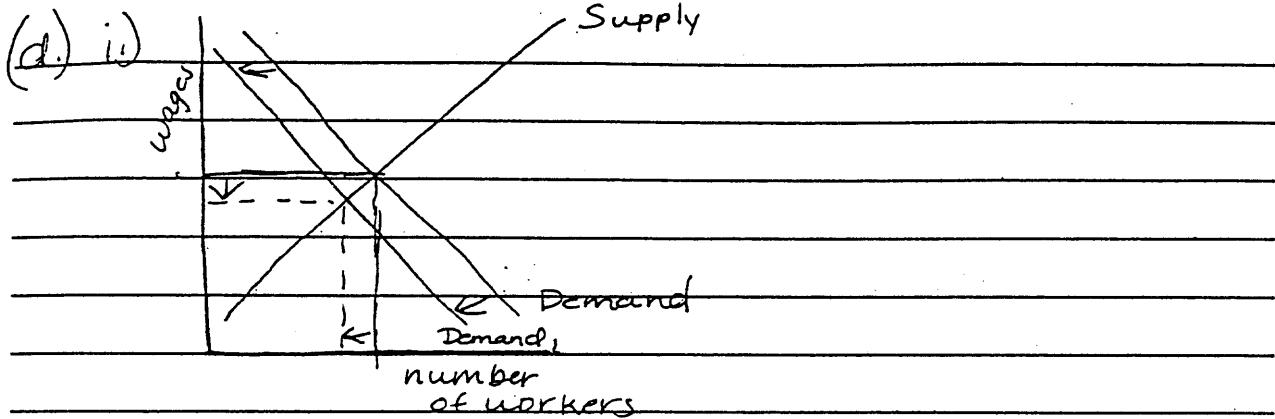


The wage rate for nectarine workers will be forced down with nectarine prices. The quantity hired will also decrease.

**Comment:** This student misses all the points in Part (a) because supply and demand analysis is used instead of firm analysis, and incorrect results are obtained. In Part (b), the student shifts the supply curve, correctly concludes that price decreases and quantity increases, and earns two points. In Part (c), the student appears to ignore the statement that nectarines and peaches are substitutes. The student earns one point for the decrease in price and quantity of nectarines. The second point is not awarded because the student does not provide a complete explanation. The student earns only one point in Part (d) because the marginal revenue product argument is not given, but the wage and employment results are correct.

**Student Response 7 (score of 3)**

- (a.) i) ~~The quantity of peaches produced will indefinitely increase. An increase in technology for any product not change. The technology breakthrough will only reduce costs for her, it does not affect the supply in any way.~~
- ii) The cost of peaches will decrease because the production cost of production for peaches decreases.
- iii) Joyce will experience substantial short run profits because the price decrease will increase the demand. Which means more will be sold.
- (b.) i.) The price of peaches will ~~increase~~ decrease because the cost of production for all peach producing firms have dramatically decreased.
- ii.) The quantity of peaches will increase because new firms will use more of the technological breakthrough, in turn, increasing supply.
- (c.) i) The price of nectarines may ~~not~~ increase because there are more buyers buying peaches. ~~and~~ So in order for nectarines to remain in the industry and receive profits, there must be an increase in price.
- ii.) The quantity of ~~nectarines~~ peaches will not be affected in any way. The production of peaches has nothing to do with the production of nectarines.



- i) As shown in the diagram above, the wage rate for nectarine workers will decrease because the demand shifted to the left, a decrease in demand.
- ii) As a result of the leftward shift in the demand, the number of workers hired, also, will decrease.

**Comments:** This essay indicates a lack of knowledge of theory of the firm and confuses price and cost in Part (a). The essay earns no points in Part (a). The essay earns full credit in Part (b) by indicating the price and quantity effect of the new technology on the industry as a whole and the accompanying explanation of the shift in the supply curve. Part (c) involves a series of statements indicating little economic knowledge. The student earns only one point in Part (d) because the marginal revenue product argument is not given.

#### Student Response 8 (score of 2)

- a) The quantity of peaches produced will increase since the cost of producing peaches will decrease. The price of peaches will also decrease since the marginal cost of peaches will decrease. The short run profits should also increase considerably since both demand and supply of peaches will increase for Joyce.

- b) The price of peaches should remain approximately the same ~~same~~ since even though the supply of peaches increases, there will be an additional increase in the demand for peaches as well. The quantity of peaches produced should also increase since more peaches can be produced for the same total cost of production.
- c) The price of nectarines should increase slightly, or have ~~very~~ no change since a decrease in the supply of nectarines is accompanied by a decrease in the demand for nectarines. The quantity of nectarines produced should decrease since less is demanded and the ~~total~~ average cost of producing nectarines has increased.
- d) The wage rate for nectarine workers should decrease ~~slightly~~ since ~~less~~ the demand for nectarine workers will decrease. The number of nectarine workers hired should also decrease since the demand for nectarine workers decreased

**Comment:** This student misses all of Part (a) due to faulty use of supply and demand analysis. The student receives a  $\frac{1}{2}$  point in Part (b) for recognizing that industry output increases after a decline in costs. The student makes a classic error by confusing an increase in the quantity demanded with an increase in demand (shift in the curve). An additional  $\frac{1}{2}$  point is earned in Part (c) for recognizing that the quantity of nectarines will decrease. In Part (c), the student underscores his or her lack of knowledge of the difference between a movement along the curve versus a shift in the curve. The student earns only one point in Part (d) because the marginal revenue product argument is not given.

**Student Response 9 (score of 1)**

1(a) (i) The quantity of the peaches produced will be increased. This is able to be done because it costs her less to produce, and by increasing the quantity produced, she will be increasing her profits. This will create a surplus of the product forcing her to lower the price so that a profit is made.

(ii) The price of peaches will decrease, because enable for a profit to be made, you must sell more of the product.

(iii) In the short-run, her profits will increase because of the technological breakthrough, but in the long-run will decrease because peaches aren't picked all year long. There would be a shortage of the good, which would decrease output and increase input. When ~~pick~~ picking season comes again, she will return to "Profit Maximizing" in the short-run.

1(b) (i) The price of peaches will remain the same, but quantity supplied will decrease, because if every firm is producing a large amount of the product, then the individual firm would not sell enough to cover what it costs to produce a large quantity. Therefore, the price will remain the same, the supply will decrease and possibly will fire workers.

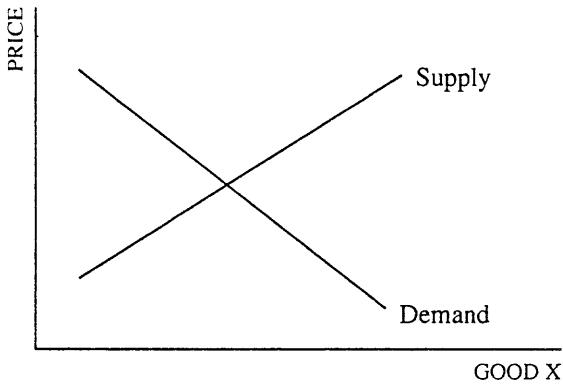
(ii) The quantity of peaches produced will decrease, because with every firm producing the same amount and selling at the same amount, you would have a surplus of the product and would be producing more than you could sell.

d. (i) The wage rate will decrease, because if her product is not being sold, then she will not be able to cover her AVC which will put her out of business. By lowering the wage rate, she is giving herself a greater chance of covering AVC and breaking even.

(ii) The number of workers hired will decrease, because she no longer is capable of producing as ~~much~~ ~~as~~ many nectarines. The less of the product produced, the less amount of workers needed.

**Comment:** This essay is an example of a series of statements signifying little economic knowledge. The essay earns one point in Part (d) by correctly stating that the wage rate of nectarine workers would decrease and the employment of nectarine workers would decrease. The essay demonstrates the application of the holistic approach where the reader looks for one correct relevant statement as the basis for a non-zero score.

## Free-Response Question 2



2. Production of good X imposes costs on people who are neither producers nor consumers of good X.
  - (a) A senator proposes a per unit sales tax on good X. Explain how this tax will affect each of the following.
    - (i) The price paid by consumers
    - (ii) The quantity of good X produced
    - (iii) The total after-tax revenues received by producers of good X
  - (b) Explain how imposing this tax might result in greater economic efficiency than would be achieved in an unregulated competitive market.

### Question 2 Scoring Guide

Basically the point distribution is 3 points for Part (a); 2 for Part (b).

#### Part (a): 3 points

Supply curve shifts to the left (the vertical distance is the amount of the tax) or supply decreases. The price paid by the consumer increases and the equilibrium quantity decreases. The total after-tax revenues received by the producers of the goods decrease because the price received by the producers (equilibrium quantity intersects original supply curve) is less and so is the quantity produced.

Points:

1 – Supply curve shifts leftward. If supply and demand are *both* shifted, the student does not receive the point. [If the demand curve shifts to the left, the student must give the correct analysis to receive full credit.]

$\frac{1}{2}$  – Price paid by the consumer increases.

$\frac{1}{2}$  – Quantity decreases.

$\frac{1}{2}$  – The student must recognize that there is a decrease in after-tax revenues.

$\frac{1}{2}$  – The student must link the decrease in revenues to the decrease in price received by producers, and the decrease in quantity.

#### Part (b): 2 points

The original price does not capture all of the social costs due to the negative externalities and hence it is inefficient. With the imposition of the tax, at least some of the social costs are captured in the costs to the firm. Thus, the post-tax equilibrium is more efficient than the pre-tax equilibrium.

Points:

The following is a discussion of the points given for alternative answers; the points are not additive.

$\frac{1}{2}$  – The student discusses productive efficiency rather than allocative efficiency. The typical argument is that the tax forces the firm to search for ways of reducing production costs to protect or restore the pre-tax profit position.

$\frac{1}{2}$  – The student recognizes allocative inefficiency by using the language in the question (i.e., “imposes costs on people who are neither producers nor consumers”), but doesn’t explain how and why the tax impacts inefficiency.

- 1 – The student goes beyond the answer immediately above by using other terminology (e.g., negative externalities, spillover costs, msc>msb, etc.), but still doesn't explore the impacts of the tax.
- 1½ – The student explains that the tax leads to a reduction in output, and that this in turn promotes economic efficiency by reducing the costs borne by people who are neither producers nor consumers of this good.
- 2 – The student explains that, by reducing the output after the imposition of the tax, the marginal private costs are approaching the marginal social costs, or marginal social costs are closer to marginal social benefits, etc.

After the faculty consultant has finished allocating the points, the answer is looked at as a whole and ultimately judged by its overall quality. This is especially true if the total score includes a ½ point. 5 should reflect an excellent answer; 4 an excellent answer with

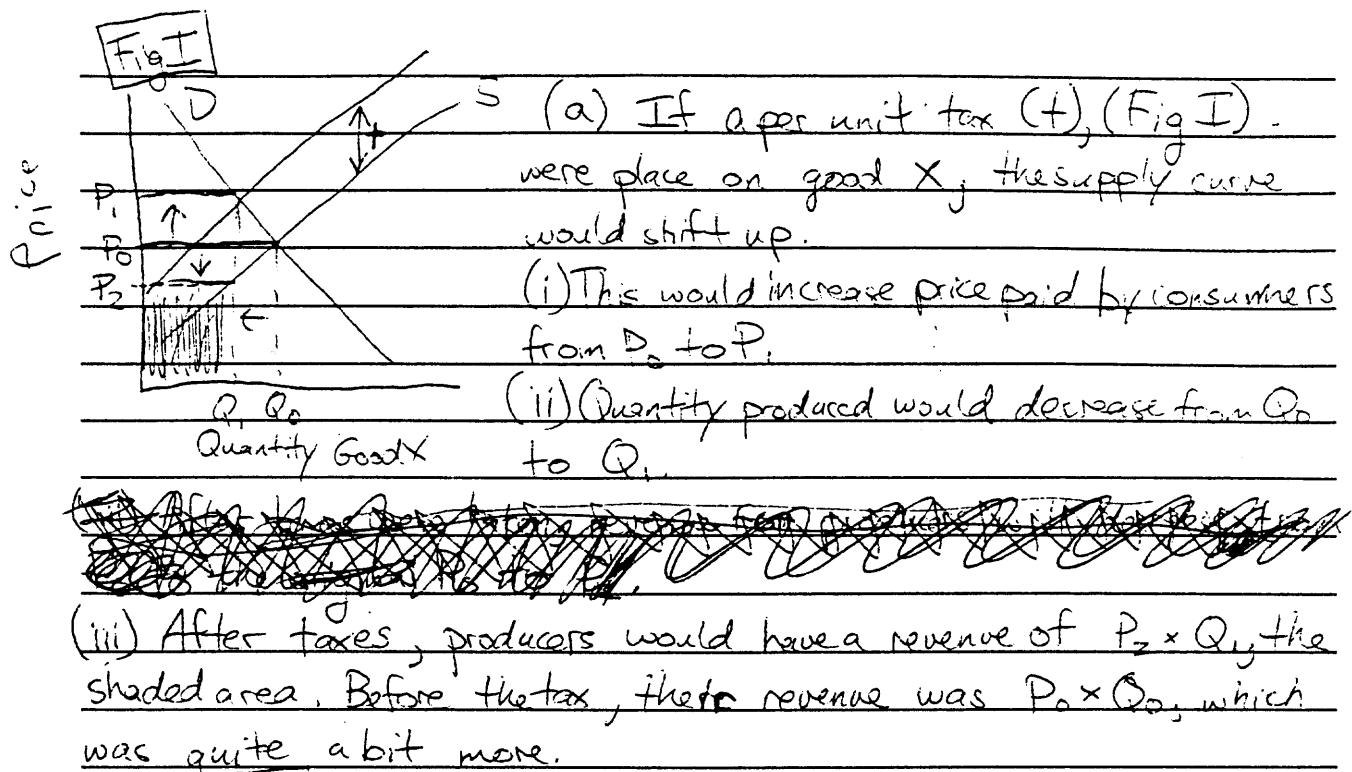
a flaw; 3 a good answer; 2 an adequate answer; 1 a seriously deficient answer, but still an answer; 0 all else.

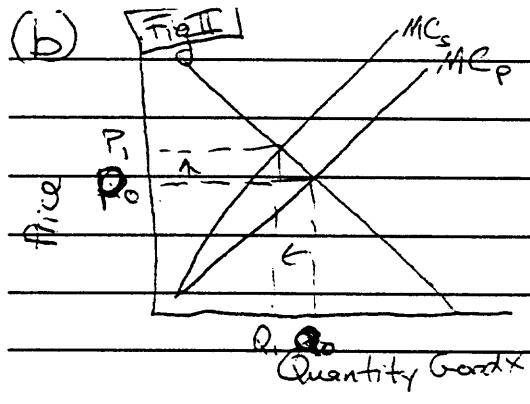
### Overall Comment on Question 2

Question 2 tests the understanding of the effects on a product market of the implementation of a per-unit tax, the interaction between these effects and a firm's revenue, and the use of a tax on a good with negative externalities. This question uses supply and demand analysis, a fundamental analytical tool in economics. The question tested well with a good distribution of grades across the spectrum. Frequently, students answered last year's question of a cigarette tax and the effect of different demand elasticities on tax revenue instead of this year's question. Consistent with prior experience, the economic efficiency question proved to be difficult for students; many confused productive efficiency with allocative efficiency.

## Sample Student Responses

### Student Response 1 (score of 5)



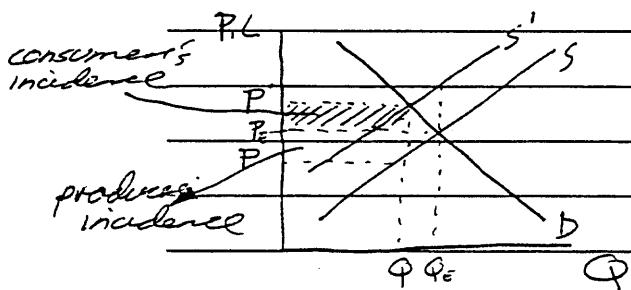


In Fig II,  $MC_P$  represents the marginal cost for the company, while  $MC_S$  represents the Marginal Social costs, which is the cost to the company added to all third party costs. An efficient market would operate when  $MC_S = P_1$ , with  $Q_1$  and  $P_1$ , but without a tax, the company will produce at  $Q_2$  and  $P_2$ , too high an output and too low a price to be efficient. The tax would increase efficiency.

**Comment:** This is an excellent answer in terms of content, brevity and use of graphical analysis. The student shows and explains that the supply curve shifts upward by the amount of the per-unit tax. The equilibrium price increases and the equilibrium quantity decreases. The decline in revenue is identified and illustrated clearly with the student indicating that the decline in revenue is due to the decrease in output and the decrease in the price to the producers ( $P_2$ ). Finally, the student correctly describes the marginal private costs as distinct from the marginal social costs, and provides the efficient point of operation where price is equal to the marginal social costs. This student clearly explains how the tax-induced decrease in output leads to economic efficiency where price equals marginal social cost.

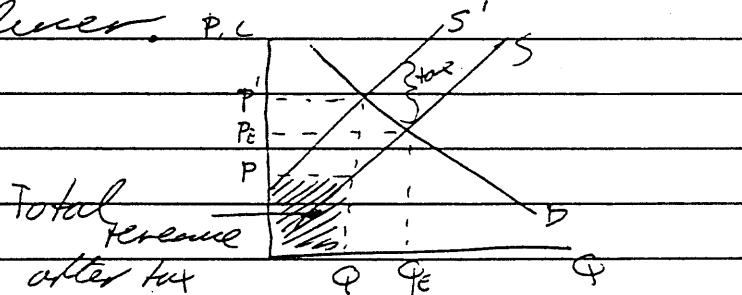
#### Student Response 2 (score of 4)

- 2 If the senator proposes a tax, the supply of good X will shift to tell increasing the price of the good and decreasing the quantity supplied, as in the diagram below.



The price paid by the customer would increase from  $P_E$  to  $P'$  but the customer would not bear the incidence of the tax entirely, the producer would pay the other part.

The quantity produced would fall from  $Q_E$  to  $Q$  due to the shift in supply and demand. The total after tax revenues would fall from  $P_E \times Q_E$  before the tax to  $P \times Q$  after the tax for the producer.



- b) The tax would lead to economics efficiency where the producer would allocate resources in the most efficient manner and produce in the most efficient way possible and try to prevent negative externalities caused by production, if it is cheaper to change his production method less pay the tax. The producer also has to consider the effect of the tax on the demand for his products when considering his production method and the tax.

*Comment:* The answer is good, particularly in Part (a). This student earns all three points in Part (a) by showing that the implementation of the tax shifts the supply curve to the left, by clearly specifying that the price to the consumer increases and the quantity decreases, and by delineating graphically as well as verbally that the after-tax revenue has declined due to the decrease in output and the decrease in the price received by the producer. The graphical analysis supports and elaborates on the written work. Only one of the two points in Part (b) is earned. This answer recognizes that the pre-tax situation is inefficient because of a negative externality. However, no correct explanation is provided of how the tax promotes efficiency. The discussion seems to relate to productive efficiency which is not affected by the per-unit tax.

**Student Response 3 (score of 3)**

- ② a) A per unit sales tax on good X which has negative externalities will decrease the supply of good X's production. Suppliers will be less likely to supply the same amount of good X if it costs more to sell to consumers. The supply curve for good X will shift to the left, resulting in an increase in the price paid by consumers, a decrease in the quantity of good X produced. The producer will receive the same per unit revenue while the government collects the tax. If the demand curve for good X is <sup>relatively</sup> inelastic, the producer will receive increased revenues; but, if demand for good X is elastic, the producer will receive decreased revenues.
- b) By taxing a good with negative externalities, the ~~producer~~ producer is forced to find a more efficient method of minimizing the third-party costs of the good. The producer will want to make profits, so he will minimize the extra costs of externalities in order to operate efficiently. Efficient methods will then replace the old ones and economic efficiency will be achieved after it meets the regulations.

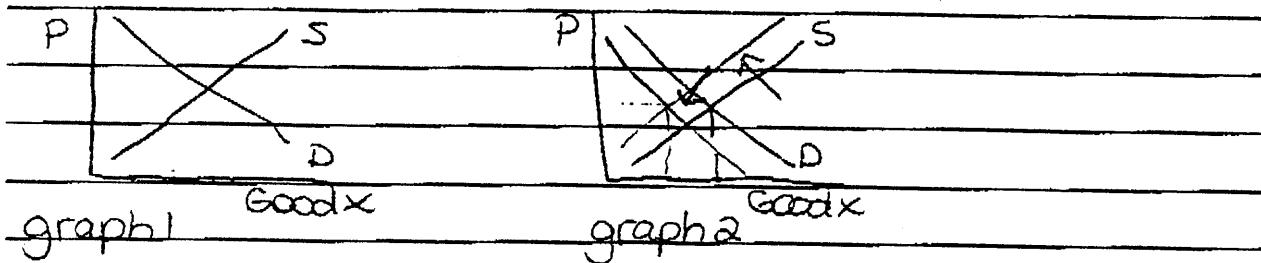
**Comment:** This answer is adequate. In Part (a), the essay clearly indicates that the supply curve shifts to the left due to the tax, and the shift results in an increase in equilibrium price and a decrease in equilibrium quantity. However, the effect on the producers' after-tax revenue is incorrect. The student is confused and enters into a discussion of government tax revenue and the elasticity of the demand curve. Quite probably, the student is confusing the 1995 question with the 1994 question of taxing cigarettes. In Part (b), the student earns one point for recognizing that negative externalities are causing economic inefficiency. The student does not *explain* how the tax will increase efficiency.

**Student Response 4 (score of 2)**

- a) i) The price paid by the consumers will increase because it will be more expensive for the producers to produce good X. Therefore, they must charge more.
- ii) The quantity of good X produced will decrease because it will be more expensive to produce it.
- iii) The total after-tax revenues received by producers of good X will decrease because the price and quantity produced decrease.
- b) Imposing this tax might result in greater economic efficiency than would be achieved in an unregulated competitive market because the costs imposed on people who are neither producers nor consumers will decrease due to the amount of good X produced.

**Comment:** This student receives 1½ points in Part (a) for correctly identifying the changes in price, quantity, and total revenue. There is no indication that the student realizes that the supply curve has shifted to the left, nor is there a correct explanation for the decrease in total after-tax revenues. The final ½ point in Part (b) is earned for attributing the initial inefficiency to costs imposed on people who are neither producers nor consumers of good X.

**Student Response 5 (score of 1)**



a. With a per unit sales tax on good X, both the supply and demand will decrease.

i. As shown by graph 2, Price paid by consumers is undetermined.

ii. However, the quantity of good X produced will decrease.

iii. Producers are selling less of good X, so therefore, revenues will decrease because they still have to pay the tax on good X.

b. The tax could create demand for good Y and thus improve the economic efficiency in another area.

*Comment:* This answer indicates little knowledge of economic principles. The student incorrectly shifts both supply and demand. This is a clear indication that he or she does not understand the difference between a shift in the curve and a movement along the curve. The student does see that the supply curve would shift but does not realize that this results in a decrease in quantity demanded, not a decrease in demand. Still, a full point is earned in Part (a) for correctly identifying the changes in quantity and total revenue. The answer provided for Part (b) is nonsense economics and earns no credit.

### Free-Response Question 3

3. (a) Identify the relationship between price and marginal revenue and explain why this relationship exists for each of the following.
- (i) A perfectly competitive firm
  - (ii) Monopoly
- (b) A firm's market power is sometimes measured by using the following formula

$$\frac{(P-MC)}{P}$$

where  $P$  is price and  $MC$  is marginal cost at the profit-maximizing output level. Some economists claim the larger the value of the index, the greater the firm's market power.

- (i) Explain why this index is always positive for an imperfectly competitive market.
- (ii) Using the formula, calculate the market power of any perfectly competitive firm.

#### Question 3 Scoring Guide

Basically the point distribution is 3 points for Part (a); 2 points for Part (b).

#### Part (a): 3 points

Marginal revenue, the additional revenue from selling one more unit, equals the price under perfect competition because the firm is a price-taker; the constant price is determined in the market and the firm is such a small part of the market that it cannot affect the price. Marginal revenue is less than the price in monopoly because the MR curve lies below the demand curve.  $MR < P$  because the monopolist must reduce the price to sell an additional unit of output, but the price must be reduced on *all* units of output. In a monopoly, the profit-maximizing level of output is set where  $MR=MC$ ; the price for that level of output is read off the demand curve.

Points:

½ – Assertion that price equals MR ( $P=MR$ ) for perfect competition.

1 – Explanation for perfect competition relationship between price and MR. Price-taker or horizontal demand is a ½ point; a more complete use of the marginal revenue concept is needed for the other ½ point.

½ – Assertion that price is greater than MR ( $P>MR$ ) for monopoly.

1 – Monopolist explanation: A downward sloping demand curve receives a ½ point. The explanation that the firm must decrease price on all units, or on all previous units in order to sell additional units is needed for the other ½ point.

#### Part (b): 2 points

The profit-maximizing output is determined where  $MR=MC$  and since  $MR < P$  as in Part (a), it follows that  $MC < P \Rightarrow$  numerator is positive for the monopolist. Since  $P=MR$  in perfect competition, the profit-maximizing point  $MR=MC \Rightarrow P = MC \Rightarrow$  the index is zero for perfect competition.

Points:

1 – Recognition that profit-maximizing output occurs where  $MR=MC$ . (This statement may be found anywhere in the answer.)

½ –  $P > MC \Rightarrow$  index is positive for imperfectly competitive markets.

½ –  $P = MC \Rightarrow$  index is zero for perfect competition.

After the faculty consultant has finished allocating the points, the answer may be looked at as a whole and ultimately judged by its overall quality. This is especially true if there is a ½ point in the total score. 5 should reflect an excellent answer; 4, an excellent answer with a flaw; 3, a good answer; 2, an adequate answer; 1, a seriously deficient answer, but still an answer; 0, all else.

#### Overall Comment on Question 3

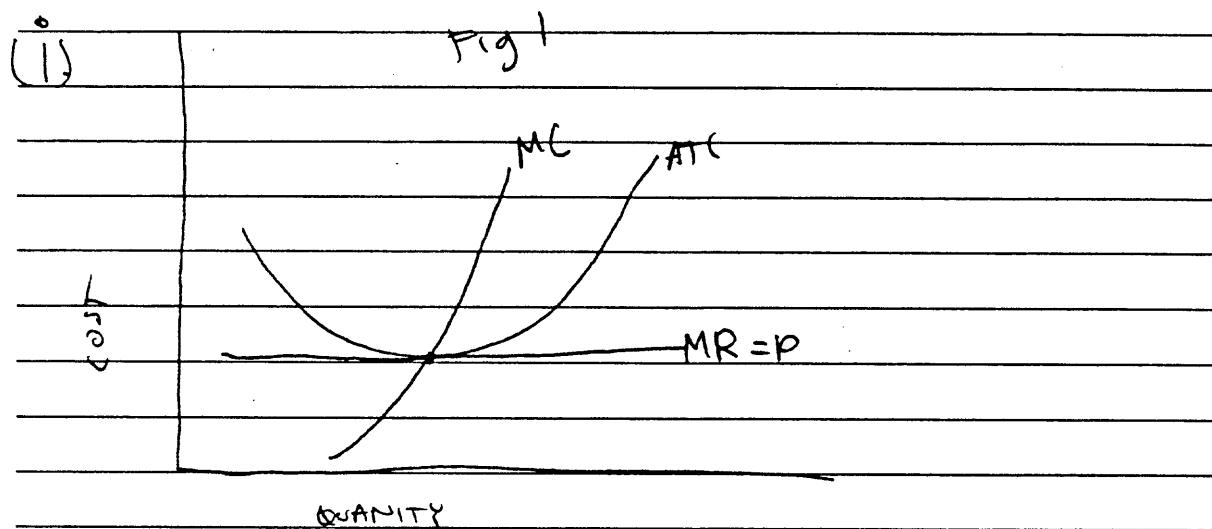
The third microeconomics question focusses on the relationship between price, marginal revenue and marginal cost for a profit-maximizing monopolist and a profit-maximizing firm operating under perfect competition. The explanation for why a marginal revenue curve is not the demand curve for a monopolist continues to pose a problem for students as a similar question did in 1994. However, Part (b), using the market power index, did not appear to be difficult for the students.

Faculty consultants thought that the question was a good discriminator. The ability to articulate why marginal revenue was not equal to demand separates the student who memorizes information from the student

who *understands* the material. Further, students who understand the basic monopoly and perfect competition models could score well on this question.

## Sample Student Responses

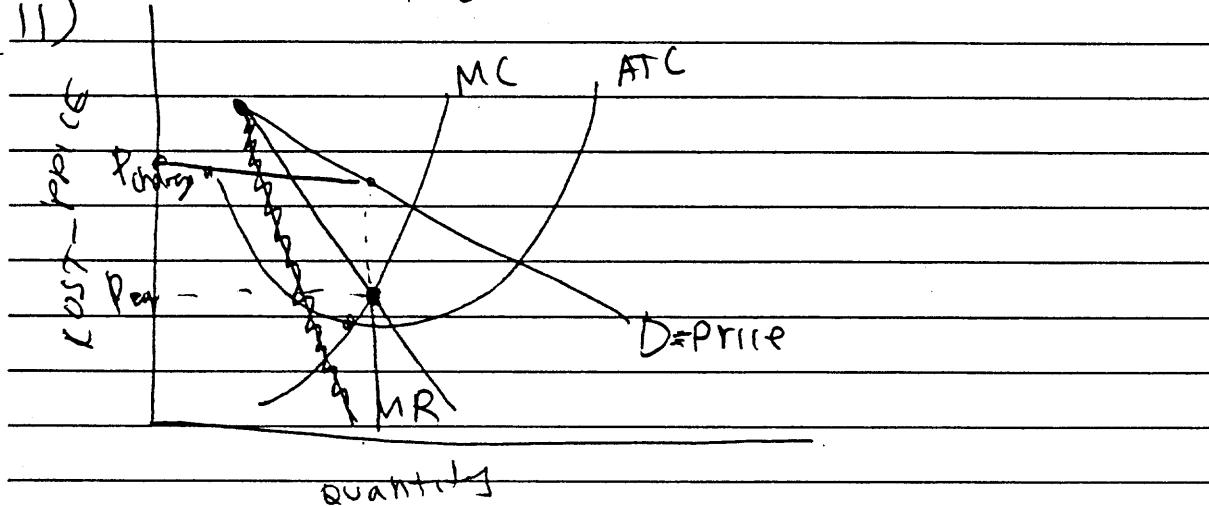
### Student Response 1 (score of 5)



In a perfectly competitive ~~firm~~ industry for a perfectly competitive firm, Price equals Marginal Revenue. The reason is that the ~~are~~ firms in the perfectly competitive industry are price takers they can have no say in what the market price will be. ~~Also~~ And also they are in a market with 100,000's produces so everything they make can be sold because it makes up such a small fraction of the total. ~~therefore~~ Therefore with each additional product they sell, the increase in revenue is the price paid for their product.

(ii)

Fig 2



In ~~an~~ a monopoly, the firm faces the industry demand curve because it is the only producer. Accordingly the Marginal revenue does not equal price instead demand = Price. The reason is that the monopoly firm is a price setter (maker). For it to increase profits ~~a monopoly must~~ by selling more, a monopoly must  $\downarrow$  price, ~~but the decrease is~~ to sell the additional product. But when it decreases price of ~~both to sell~~ the last product, it must decrease the price of all the previous products. That is why as  $Q \rightarrow \infty$  the distance between the demand and  $MR \uparrow$ . ~~Also~~ Also the monopoly makes an economic profit because when it produces at the output where  $MR = MC$ , it will charge the PRICE that corresponds with the demand curve (see Fig 2).

$$\frac{(B)(j)(P-MC)}{P}$$

The value will always be positive for an imperfectly competitive firm because although they produce at an output where  $MC \cap MR$ , they charge a price that is ALWAYS greater than  $MR$  (see Fig 2)

for monopistic example.

$$\text{therefore } MC = MR$$

$$\frac{(P-MC)}{P} > \frac{(P-MC)_{\text{but}}}{P-MR} = \frac{\text{positive}}{\text{positive}} = \text{positive}$$

$\downarrow$   
is positive  
is always positive by  
cuz you can't charge a - price

so the  $\frac{P-MC}{P}$  is positive for all imperfectly competitive firms

(ii) For a perfectly competitive firm they produce where  $MR=MC$  but  $MR=P$

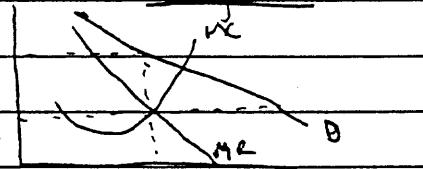
$$\frac{P-MC}{P} = \frac{MR-MC}{P} = \frac{MC-MC}{P} = \frac{0}{P}$$

$\circlearrowleft$   
is always the value for perfectly competitive firms.

**Comment:** This is an excellent answer, although not perfect. The explanation for the relationship between marginal revenue and price for the firm operating under perfect competition is succinct and complete. Likewise, the discussion for monopoly demonstrates the relationship between price and marginal revenue and provides the correct explanation for the marginal revenue being less than price. Although not relevant to the question, the student asserts that the monopoly earns an economic profit; this is true in the diagram presented but is not necessarily true for *all* monopolies. In Part (b), the student clearly recognizes that under all market structures the profit-maximizing point is  $MR=MC$ , and that under monopoly  $P>MR$ . By integrating these two pieces of information, the student correctly demonstrates that for firms operating in an imperfectly competitive market, the index is positive, and that in a perfectly competitive market, the index is zero.

**Student Response 2 (score of 4)**

- a) In both perfectly competitive and monopoly industries, the profit-maximizing output rate is where  $MC=MR$  (marginal cost = marginal revenue). For a perfectly competitive firm this is also equal to price because a perfectly competitive firm can sell as much as it wants at the market price; so  $P=MR$ . But for a monopoly to maximize profit, ~~it~~  $MC$  still equals  $MR$  but Price is greater than marginal revenue. ( $P>MR$ ) A monopoly determines output rate by where  $MC=MR$ . (Fig. c). It then sets price  $P_2$  where output is equal to demand at  $P_2$ . Instead of setting price at where  $MC=MR$  ( $P_1$ ) like perfectly competitive firms do, monopolies don't need to because they have no competition and they therefore charge the higher price.



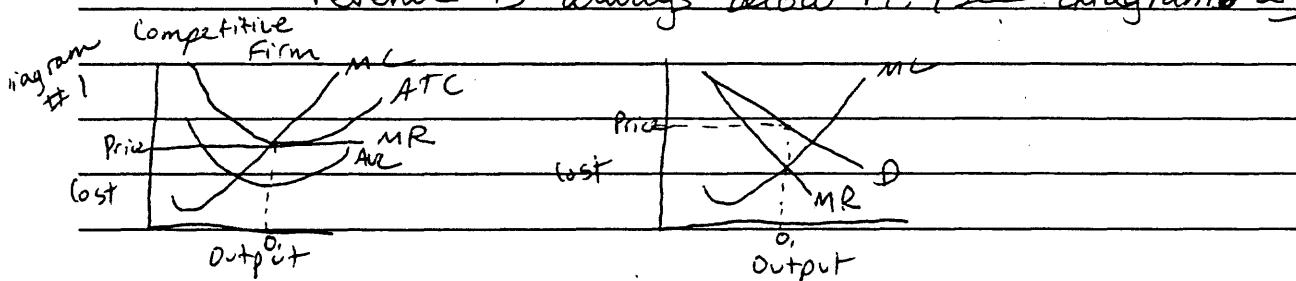
b) The only markets where  $P=MC$  is a perfectly competitive one (to maximize profits of course) Therefore the index for a perfectly competitive firm will be zero since  $P-MC=0$ . But for any other market  $P>MC$  and therefore  $P-MC$  will always be positive.

*Comment:* This is a good answer. In the first part, the relationship between price and marginal revenue is clearly stated for both perfectly and imperfectly competitive markets, and the explanation for the perfectly competitive market is given. However, no explanation is provided as to why the marginal revenue curve lies below the demand curve under imperfectly competitive situations. In Part (b), the value of the index for a perfectly competitive firm is stated and explained. The faculty consultant had to integrate what the student has said in Part (a) and in Part (b) for the imperfectly competitive model to arrive at the student's conclusion of a positive index.

### Student Response 3 (score of 3)

A. i. In a perfectly competitive firm, price is determined by ~~the~~ marginal revenue. (see diagram #1)

ii. In a monopoly, price is determined by the height of the demand curve and marginal revenue is always below it. (see diagram #2)



B. i. Price in a monopolistic competitive market is always above marginal cost. Thus, using the formula would always result in a positive number. For example:

$$\frac{5-4}{5} = \frac{1}{5} = .20$$

ii. Market power of any competitive firm

$$\frac{5-5}{5} = \frac{0}{5} = 0$$

Price equals marginal cost so the answer is always 0.

*Comment:* This is an adequate answer. The diagrams for the perfectly competitive firm and the monopolist, showing the correct relationship between price and marginal revenue, earn two points. There is not an explanation and, hence, full credit is not earned in Part (a). Note that the graphical presentation helped the student earn points. The answer only receives partial credit in Part (b) for the assertion of the value of the index for each market structure. There is no recognition that the profit-maximizing output occurs at the point where marginal revenue equals marginal cost.

**Student Response 4 (score of 2)**

a.(i) In a perfectly competitive firm price is equal to ~~above~~ marginal revenue. This is so that the ~~the~~ firm can realize normal profits without allowing its price to go to high to where demand for its product shifts to a substitute.

(ii) Price exceeds marginal revenue in a monopoly. This is because without competition a firm is able to set a price at which its consumers will still buy; this price is above marginal revenue.

b.(i) This will be positive because price exceeds marginal cost (which is equal to marginal revenue) in an imperfectly competitive market. An example of this would be a monopoly.

(ii)  $P = MC$  so  $\frac{(P - MC)}{P}$  will equal 0

*Comment:* This answer receives a  $\frac{1}{2}$  point for the assertion that  $P = MR$  for perfect competition and a  $\frac{1}{2}$  point for the assertion that  $P > MR$  for monopoly. No explanation for the relationships is provided; explanations are required for full credit. The student earns a  $\frac{1}{2}$  point for asserting that the index will be positive for imperfectly competitive markets and a  $\frac{1}{2}$  point for stating that the index is zero for firms under perfect competition. There is no recognition that the profit-maximizing output occurs at the point where marginal revenue equals marginal cost.

**Student Response 5 (score of 1)**

3(a) ~~In a perfectly competitive firm, marginal revenue is~~

~~equal to price~~

~~be able to~~

(b) ~~In an imperfectly competitive market, firms will set~~

~~a price higher than the marginal cost, and will do so;~~  
~~consequently, P-MC will be positive.~~

(ii) ~~Since price is equal to marginal cost,  $\frac{P-MC}{P} = \frac{0}{P} = 0$ .~~

~~Perfectly competitive firms have no market power~~

*Comment:* The student does not attempt to answer Part (a). In Part (b), the student earns a  $\frac{1}{2}$  point for the statement that the index will be positive because price is greater than marginal cost for imperfectly competitive market, and a  $\frac{1}{2}$  point for the statement that the index equals zero under perfect competition because the price equals marginal cost. In both cases, the student does not explain why these relationships hold. The student does not explain that profit maximization occurs at the point where marginal revenue equals marginal cost for all firms.

